



# **APPENDIX B**

## **HEALTH AND SAFETY PLAN**

FOR

**REMOVAL ACTIVITIES**

AT THE

**TOLEDO TIE TREATMENT SITE  
TOLEDO, OHIO**

LOCATED AT

**ARCO INDUSTRIAL PARK  
TOLEDO, OHIO**

FEBRUARY 1998  
(Revised April 1998)

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## ATTACHMENTS

Attachment A	Quick Reference Guide for Field Personnel
Attachment B	Personnel Acknowledgement to HASP
Attachment C	Material Safety Data Sheets
Attachment D	Confined Space Entry Supplement
Attachment E	Trenching and Excavation Supplement
Attachment F	Energy Control
Attachment G	Emergency Telephone Numbers and Map to Hospital
Attachment H	Accident Illness/Injury Investigation

## **B.1.0 INTRODUCTION**

### **B.1.1 General**

Hull & Associates, Inc. (HAI), has been retained by Kerr-McGee Chemical, LLC, to create this Health and Safety Plan (HASP), in accordance with the Unilateral Administrative Order (UAO) issued by the United States Environmental Protection Agency (U.S. EPA). This HASP has been prepared with the intention to provide minimum health and safety requirements for the removal activities to be conducted at the former Toledo Tie Treatment Site, located in Toledo, Ohio, in the Arco Industrial Park.

The property is occupied by several local businesses that may be in contact with the known or suspected areas of contamination. These businesses are located around or in the vicinity of the Toledo Tie Treatment Site, hereafter referred to as the "Site". All applicable safety precautions shall be taken to assure that there is no potential for a hazardous release (i.e., dermal contact, inhalation, ingestion etc.) to the public, on-site workers, visitors, or the environment. While the closest residential area is approximately one-quarter of a mile away, all necessary security measures shall be implemented to control the Site and ensure public safety and welfare. This HASP also addresses health and safety guidelines for activities to be completed with respect to the time critical removal action, as well as the Engineering Evaluation and Cost Analysis (EE/CA).

This HASP is fairly complex and lengthy due to anticipated site conditions and nature of the planned activities. To facilitate use by on-site personnel, a quick reference field guide detailing the more important and most used portions of this plan is located in Attachment A. This attachment may be removed and distributed to field personnel prior to commencement of field activities and after personnel have read this complete HASP and acknowledged their understanding of this HASP, by their signature as required under Attachment B.

### **B.1.2 Purpose**

The specific purpose of this HASP is to detail the applicable engineering, administrative, and protective provisions which shall be followed to help ensure that the health and safety of the surrounding community, site personnel, and visitors is adequate. It also fulfills the applicable regulations mandated by the Occupational Safety and Health Administration (OSHA), U.S. EPA, and Ohio EPA including, but not limited to:

1. 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response)
2. 29 CFR 1910.1200 (Hazard Communications)
3. 40 CFR 264.54 and 1905.08(d)(4)(i) (EPA Contingency Planning)
4. 29 CFR 1926, Construction Industry Standards (Subpart P Excavations)

### **B.1.3 Site Location and History**

The former Toledo Tie Treatment Site is an abandoned wood-preserving site that utilized coal tar creosote from 1923 to 1962. The Site is located in the City of Toledo, Lucas County, Ohio, and identified by the approximate coordinates of 41 degrees 38' 00" North latitude and 83 degrees 37' 05" West longitude. A site location map is presented in Figure 1. The Site encompasses approximately fifty acres, with the most heavily contaminated zones being the suspected waste lagoons, Williams Ditch, and the former creosoting tank farm. The Site is surrounded by areas zoned commercial and light industrial, and is known as Arco Industrial Park. The general project area is bounded by Hill Avenue to the north, Arco Drive to the west, Frenchmens Road to the south and Conrail railroad tracks to the east. Williams Ditch flows from southwest to northeast across the interior of the Site, ultimately discharging to Schneider Ditch and the Ottawa River.

### **B.1.4 Project Description**

In general, the objectives of this plan are to address the health and safety issues that affect personnel during remedial abatement measures and anticipated site activities, including but not limited to:

1. free product recovery

2. installation of siphon dams and containment mechanisms
3. investigative sampling, monitoring, and documentation
4. on-site waste removal and/or relocation, as needed
5. general work activities
6. construct soil erosion and sediment control measures
7. temporary road construction
8. erection of security fencing and/or other site control mechanisms

A detailed discussion of individual project tasks is included in the Removal Action Work Plan.

#### **B.1.5 Site Access and Security**

Keys to any gates shall be provided to the U.S. EPA, Ohio EPA, and the local fire and police departments if a permanent or temporary chain-link fence is constructed. Employee and equipment access shall be maintained through a designated gate area, if applicable. Signs shall be placed on the fence indicating site control measures. The signs should state "Danger, Authorized Personnel Only."

The fencing shall be inspected on a weekly basis, or more frequently, and repaired when necessary.

Personnel shall understand that all activities, data, documents, etc. are confidential and intended for use by Kerr-McGee Chemical, LLC, the U.S. EPA, the Ohio EPA, and those parties so designated by Kerr-McGee legal counsel. If approached by persons from the community or other unauthorized visitors, field personnel shall request that the person's questions be directed to the immediate Site manager or the Project Coordinator and escorted to an unrestricted area. All equipment, materials, and vehicles are the sole responsibility of the owner(s).

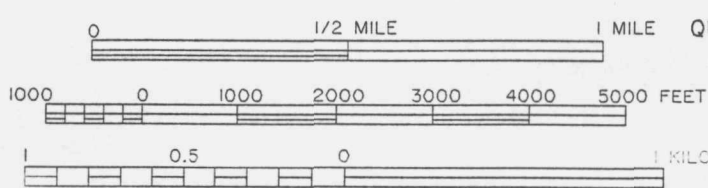
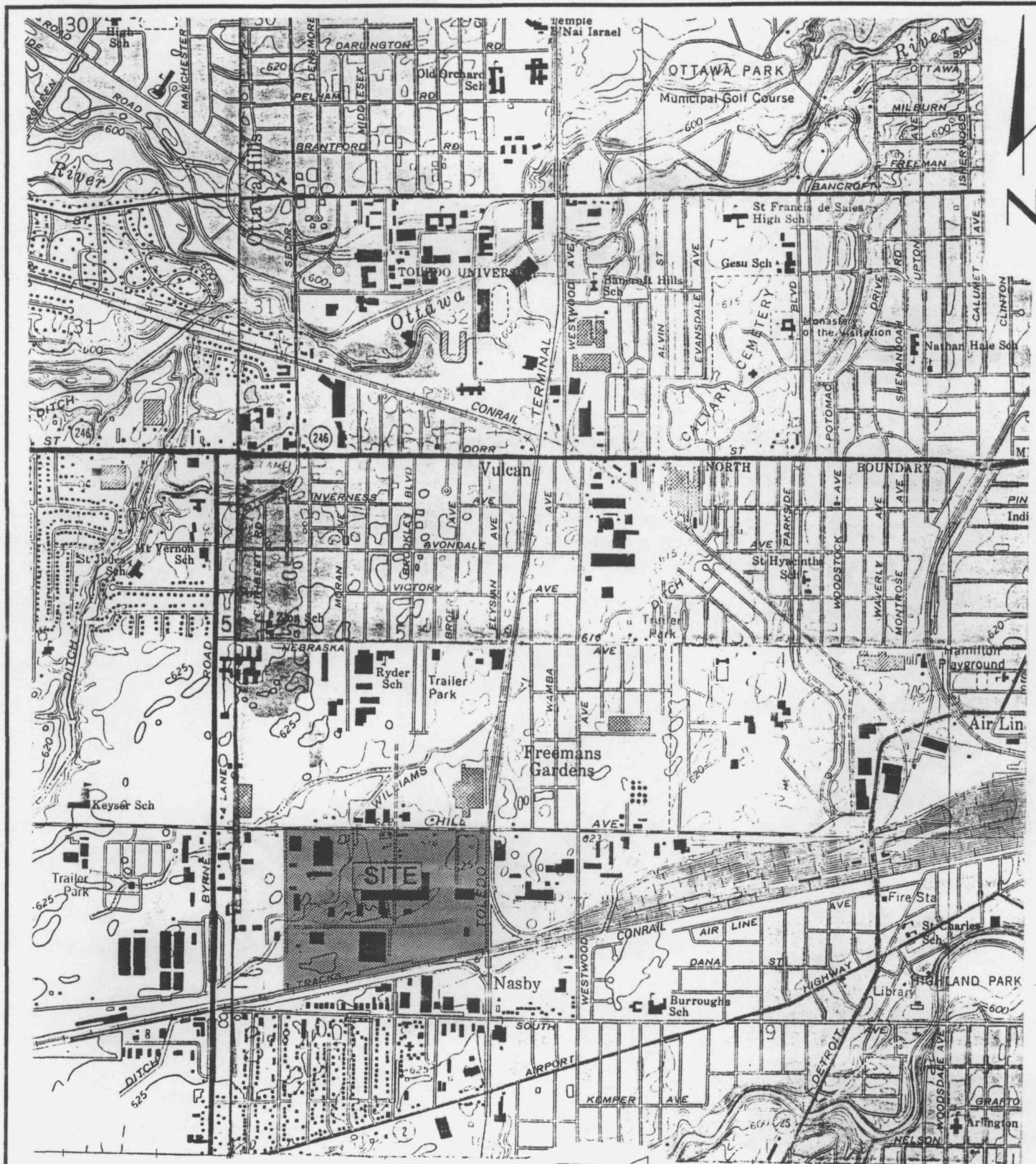


FIGURE I

Hull & Associates, Inc.  
TOLEDO, OHIO

HEALTH & SAFETY PLAN  
TOLEDO TIE TREATMENT SUPERFUND SITE

**SITE LOCATION MAP**

CITY OF TOLEDO, LUCAS CO., OHIO

DATE:  
FEBRUARY 1998

PMW001

PMW156T002  
02/17/98 SEWALD

### **B.1.6 Project Organizational Structure**

The following briefly describes the organizational structure and responsibilities of various personnel relative to administration of the health and safety program.

#### **B.1.6.1 Project Coordinator**

The Project Coordinator shall be responsible for directing all required site activities in conjunction with the UAO. The Project Coordinator shall be readily accessible and present on-site when possible, during site work. This person should also, when possible, coordinate decisions that potentially affect employee health and safety with the Health and Safety Coordinator. The Project Coordinator or his designee shall have the authority to stop any phase of the project deemed dangerous to human health and the environment and/or not in substantial compliance with this HASP.

#### **B.1.6.2 Health and Safety Coordinator (HSC)**

The HSC shall work closely with the Project Coordinator and the Site Health & Safety officer (SHSO) to ensure that all work is carried out in the safest manner possible. The HSC shall be responsible for ensuring the overall implementation and enforcement of this HASP. This person may also be responsible for verifying appropriate air monitoring procedures and personal sampling methods, as needed. The HSC shall work with the SHSO and field personnel to minimize occurrences where employees are exposed to contaminant concentrations above the corresponding permissible exposure limits (PELs) or threshold limit values (TLVs), whichever is lower.

#### **B.1.6.3 Site Health and Safety Officers (SHSO)**

Project SHSOs shall be responsible for implementing the provisions of this plan during work activities. They shall also have the authority to recommend work be ceased in case a significant safety or health concern develops. However, only the Project Coordinator or his designee can order work to begin again. SHSOs are responsible for the daily enforcement of this HASP. They shall also be responsible for conducting or directing any necessary personal or perimeter air monitoring, accident or incident investigating/reporting, contractor/employee compliance procedures, and any

other health and safety-related duties. Depending on the contractual structure of the removal activities, the SHSO may be a Kerr-McGee representative, agent, or be an employee of a selected contractor.

## **B.2.0 HAZARD ASSESSMENT**

### **B.2.1 Chemical Hazards**

The objective of this section is to identify the types of hazardous materials that may be encountered during each phase of the removal action. Several compounds were identified in various media during previous sampling events conducted by the Ohio Department of Health and the Ohio Environmental Protection Agency. The media sampled included surface and subsurface soils, surface water, groundwater, and sediment. Creosote and creosote derivatives were the primary chemical hazards identified. Coal tar may also be present. Creosote is normally yellow to black in color and can have a specific gravity greater than, or less than that of water. In many cases, the product shall be found at the surface as well as the subsurface level. Material Safety Data Sheets (MSDSs) for these compounds can be found in Attachment C. Additionally, small amounts of other potentially hazardous substances may be present at the site that have not yet been identified. These chemical hazards involve substances which may exhibit one or more of the following characteristics: toxicity, ignitability, reactivity, or corrosivity. If additional compounds are known to exist at the Site, MSDSs for those compounds shall be supplied as well.

Most activities shall be performed outside, and will be conducted in a manner to ensure limited exposure to contaminated media. Air monitoring requirements shall be based on knowledge of site conditions, previous site data, and current site data. Air sampling shall be performed before and periodically during all potential exposure situations. If air monitoring action levels are exceeded, further administrative and engineering controls shall be implemented to reduce personnel or off-site exposure to airborne contaminants. If action levels are still exceeded, appropriate personal protective equipment shall be provided to potentially affected personnel or, in the case of off-site action level excursions, operations ceased and the situation reassessed.

The general routes of exposure in which personnel may be exposed to the chemicals of concern listed in Table 2-1 include:

- inhalation of polynuclear aromatic hydrocarbons (PAHs), dusts, VOCs, and other contaminants present in ambient air
- absorption of liquid or vapor through skin (particularly eyes, mucous membranes, and feet)
- dermal contact with surface soils, surface water and sediments
- incidental ingestion of contaminated surface water and soil through poor personal hygiene and poor use of PPE
- injection of contaminants through skin (cuts, scrapes, etc.)

OSHA has established permissible exposure limits (PELs) and ACGIH has established threshold limit values (TLVs) for exposure to airborne concentrations of substances. These guidelines represent conditions under which it is expected that nearly all personnel may be repeatedly exposed daily (8-hour time-weighted average) without adverse health effects. Established levels have been listed in Table 2-1 for the compounds which may present a potential hazard to personnel at the Site. The TLV or PEL representing the lowest contaminant level shall be used as the exposure guideline. When applicable, one-half the TLV or PEL, whichever is lower, shall be used as the action level when monitoring for specific contaminants.

The acute (short-term, immediate) symptoms of exposure to the various anticipated chemical hazards are similar among hazards. In general, acute symptoms of exposure that may occur in certain individuals include the following:

- |                                     |                           |                     |
|-------------------------------------|---------------------------|---------------------|
| 1. eye, nose and throat, irritation | 5. headache               | 9. fatigue          |
| 2. headache                         | 6. respiratory irritation | 10. staggered gait  |
| 3. euphoria                         | 7. confusion              | 11. skin irritation |
| 4. giddiness                        | 8. weakness               |                     |

**TABLE 2-1  
SUSPECTED CHEMICALS OF CONCERN**

PARAMETER	PEL-TWA	TLV-TWA	STEL	IDLH	LEL
Phenanthrene	.2 mg/m <sup>3</sup>	.2 mg/m <sup>3</sup>			
Naphthalene	50 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>		250 ppm	
Acenaphthene	NR				
Benzo(a)pyrene	.2 mg/m <sup>3</sup> A2			700 mg/m <sup>3</sup>	NR
Fluoranthene	NR				
Pyrene	.2 mg/m <sup>3</sup>	NR			NR
Anthracene		NR			
Chrysene	.2 mg/m <sup>3</sup>				
Dibenzo(a,h)anthracene	.2 mg/m <sup>3</sup>				
Benzene	1 ppm		5 ppm	1000 ppm	
Coal Tar Creosote	.2 mg/m <sup>3</sup>	.2 mg/m <sup>3</sup>	---	700 mg/m <sup>3</sup>	NR

Threshold Limit Value or Permissible Exposure Limits - Time Weighted Average (TLV or PEL - TWA): the time weighted average concentrations for a normal eight hour workday or forty hour work week to which nearly all workers may be repeatedly exposed day after day, without adverse effects. PELs are enforceable OSHA standards. TLVs are recommended guidelines developed by the American Conference of Governmental Industrial Hygienists (ACGIH).

STEL - Short Term Exposure Limit: the maximum concentration to which it is felt the average worker can be exposed for a period of up to fifteen minutes continuously without adverse effects. Exposures above the PEL or TLV up to the STEL should not be longer than 15 minutes and should not occur more than four times per day. There should be at least 60 minutes between successive exposures.

IDLH - Immediately Dangerous to Life or Health: represents maximum concentration from which in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape - impairing or irreversible health effects.

(-) No value found or not applicable

(S) - Skin - Contribution to the overall exposure via the coetaneous route including mucous membranes and eyes

Ca - Suspected or confirmed human carcinogen

A2 - Suspected human carcinogen

ppm - parts per million of contaminant by volume

(SA) - simple asphyxiant - may displace oxygen in concentrated exposures or confined spaces

LEL - lower explosive limit in air

NR - None Reported

#### **B.2.1.1 Polynuclear Aromatic Hydrocarbons (PAHs)**

PAHs are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, or other organic substances. PAHs are also found in coal tar, crude oil, and creosote. The other common observations in possible creosote toxicity cases are the carcinogenic and toxic effects of PAHs contained in creosote. PAHs may be released when creosote is exposed to high temperatures or pressures. PAHs normally have a low human toxicity with slight, if any, mutagenic effects. However, PAH metabolites or derivatives may act as strong mutagens and their interactions with DNA are believed to be carcinogenic. It should be noted that the more volatile PAHs may be less toxic (and especially less carcinogenic) than the less volatile PAHs.

#### **B.2.1.2 Coal Tar**

Coal tar is almost black in color, and either a thick liquid or semi-solid. It has a distinct naphthalene-like odor. Coal tar is a complex combination of polynuclear aromatic hydrocarbons, phenols, heterocyclic oxygen, sulfur and nitrogen compounds.

#### **B.2.1.3 Benzene**

Benzene in pure form is a colorless light yellow liquid with an aromatic odor. It is a carcinogen. It is a component of many petroleum products including diesel fuel. Diesel fuel is often used as a carrier for creosote in wood preserving operations, hence benzene may be present.

#### **B.2.2 Physical Hazards**

Physical hazards associated with the project include working outside (heat or cold stress), manual labor, working in or around traffic, working in moderately rough terrain, working near a body of water, and working near heavy equipment. Field personnel must take extra precautions when walking, working, or operating vehicles on unstable, rough, or slippery ground. The specific hazards and their associated safety precautions are identified according to the type of work being conducted in Section 3.0, Hazard Analyses. The primary physical hazards to employees involve working on the steep and slippery ditch banks and with or near heavy equipment. All employees should pay particular attention to moving equipment. When working in areas where equipment

operator's visibility may be compromised for any reason, the use of spotters and hand signals is required.

### **B.2.3 Environmental Hazards**

#### **B.2.3.1 Cold Stress**

Cold stress can occur during cool or cold weather when personnel are not adequately dressed or when they perspire while wearing protective clothing. Personnel shall be encouraged to bring dry clothes and change into them when necessary. Personnel must be aware of the potential for frostbite during cold periods. Proper clothing must be worn and adequate work breaks given to allow personnel to warm up. The SHSO shall determine the required actions to assure personnel safety during cold periods. These actions shall be based on site-specific conditions (wind, rain, etc.). The following symptoms are indications of overexposure to cold conditions and require immediate attention:

- Pain or numbness in the extremities are the first early warning of danger to cold stress
- Development of severe shivering, which indicates that exposure to cold should be immediately terminated
- Decreased manual dexterity, indicating extremity overexposure
- Feelings of excessive fatigue, drowsiness, irritability, or euphoria, which require an immediate heating shelter

Cold stress conditions are significantly exacerbated by lowered air temperatures, increased wind velocity, and exposure to wet conditions. The following precautions should be followed:

- Workers should bring extra dry clothes and change into them immediately when needed. Wet clothing, including both outerwear wet from rain or snow and innerwear wet from sweating, should be removed immediately prior to entering or re-entering cold conditions.
- Avoid exposed skin and wet clothing which shall enhance the potential for frostbite.
- Wear many individual layers of clothing rather than a few bulky layers.

- Workers must be allowed adequate work breaks to warm body parts.
- Be aware that wind, snow, and rain may exacerbate cold conditions.
- Recognize that individual cold tolerances may vary.
- Protect susceptible areas such as feet, hands, nose, and ears.
- Workers with circulatory problems may require special precautionary protection against cold injury such as reduced exposure period.
- A heater such as a car heater or heated building must be nearby to warm hands or other body parts. **(Remember: Pain in hands and/or feet signifies initial stages of frostbite!)**
- Adequately insulated dry clothing must be worn when temperatures are below 40°F.
- Coffee intake should be limited because of diuretic and circulatory effects. However, adequate liquid intake (e.g., warm, sweet, non-caffeinated drinks and soups) should be maintained.
- Insulated gloves should be worn when working with metal tools or metal parts in cold weather.
- If clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until weather conditions improve.

For work in cold conditions less than 40°F workers must:

- use the buddy system and watch partner for signs of frostbite or hypothermia
- limit work rate to avoid sweating
- minimize sitting still or standing still for long time periods
- avoid work in extremely cold conditions (generally less than 20°F)
- protect themselves from drafts of open areas

- not be required to work full time in the cold generally during the first week of adjustment to conditions until workers can become accustomed to such working conditions. **Remember that individual reactions to cold working conditions can vary significantly.**

#### **B.2.3.1.1 Frostbite**

**Cause:** Exposed skin and extremities (i.e., inadequately insulated parts of the body) have a tendency to freeze in cold temperatures, especially when wet from perspiration, rain, snow or submergence in water.

**Symptoms:** The skin turns red or pink and pain is experienced in the early stage of frostbite. As frostbite develops, the skin may become a dull white or grayish yellow and may feel cold and numb. The victim may not feel pain in the later stages. Skin may blister.

**Care:** Cover the affected parts with dry insulated materials and transport victim to an indoor heated area immediately. Do not rub affected parts in snow or submerge parts in cold water. Submerge in luke-warm water (approximately 100 degrees Fahrenheit) until skin is pink. Do not use hot water or hold over an open flame or stove to warm exposed parts. Injured parts should be loosely bandaged. Keep affected parts elevated. Immediately consult a physician anytime that frostbite is suspected.

#### **B.2.3.1.2 Hypothermia**

**Cause:** Exposure to extreme cold that causes the entire body to chill or freeze. Hypothermia, complete chilling of the body, is often associated with drenching or extensive perspiration in a cold environment.

**Symptoms:** Victims may experience shivering, numbness, weakness in the muscles and joints, and a low body temperature. The victims pulse and breathing rates decrease. The victim may seem drowsy and he/she may possibly become unconscious. Eventually, death may occur.

**Care:** Transport the victim to a warm environment immediately. Remove all wet and restricting clothing and wrap the victim in dry, warm blankets or garments. **Consult a physician immediately.**

#### **B.2.3.2 Heat Stress**

Heat stress results when the body cannot cope with the increased stress of working in a hot environment. Personnel wearing protective clothing have an increased potential for heat stress

because clothing inhibits the body's natural cooling mechanism, the evaporation of perspiration. Dehydration, profuse sweating, and strenuous work conducted under such conditions can lead to heat stress. The following precautions should be taken when working in a potential heat stress environment:

- drink plenty of liquids to avoid dehydration
- drink approximately one-pint of water prior to commencing work
- at each break, drink tepid water and/or electrolyte fluids
- wear light-colored, cool clothing
- take frequent work breaks
- if possible, work during the cooler hours of the day, and avoid strenuous work between 10 am and 2 pm
- protect exposed skin from ultraviolet (UV) exposure by frequently applying sunscreen, especially between the hours of 10 am and 2 pm when the most UV damaging rays are present

Working in hot environments can cause several recognized physical injuries, which in order of increasing severity include: heat rash, heat cramps, heat exhaustion and heat stroke.

#### **B.2.3.2.1 Heat Rash**

**Cause:** Heat rash is caused by unrelieved exposure to hot humid air. The skin's sweat pores become clogged, thus causing a skin rash to appear. Covered skin is particularly vulnerable, although dried sweat over exposed skin can cause salt crystal buildup and subsequent eye and skin irritation.

**Symptoms:** Red rash, impaired sweating, mild discomfort, lowered heat tolerance.

**Care:** Allow victim to rest in cooler environment. Give victim water to drink. Wash skin with cool water.

#### **B.2.3.2.2 Heat Cramps**

**Cause:** Heat cramps, while debilitating, are easily reversible if properly and promptly treated. Caused by profuse sweating with inadequate replacement of water and salt.

**Symptoms:** Muscle spasms and pain in abdominal muscles and extremities.

**Care:** Allow victim to rest in cooler environment. Give victim at least four ounces of water every fifteen minutes for an hour.

#### **B.2.3.2.3 Heat Exhaustion**

**Cause:** Heat exhaustion is caused by physical exertion in hot environment. Profuse sweating without proper evaporation and dehydration can occur. Nervous system control and heart output are inadequate to meet demands of heat and dehydration. Heat exhaustion can lead to heat stroke if not treated properly.

**Symptoms:** Pallor, faintness, dizziness, temporary loss of breath, profuse sweating, clammy/cool skin, dilated pupils, headache, nausea and vomiting.

**Care:** Allow victim to rest in cooler environment and remove his/her protective clothing. Give the victim at least four ounces of water every 15 minutes if he/she is conscious and can tolerate it. Place the victim in the shock position (lying down with feet elevated). Cool victim by fan or applying wet towels or sheets etc. Monitor closely. Transport victim to medical facility if there are no signs of improvement.

#### **B.2.3.2.4 Heat Stroke**

Cause: The most serious of heat-induced illnesses is heat stroke because of its potential to be life threatening or to result in irreversible damage. Heat stroke results from excessive physical exertion in a hot environment. **This is a serious problem and can be fatal.** The strain placed on the circulatory system can cause the victim to go into shock.

Symptoms: Dizziness, nausea, severe headache, constricted pupils, hot dry skin, cessation of sweating, high temperature (usually 100°Fahrenheit and rising), confusion, collapse, delirium, coma, staggering gait, convulsions, and/or loss of consciousness.

Care: Transport victim immediately to a medical facility. If body is not cooled immediately, irreversible damage to vital organs may develop leading to death. Take victim to a cooler and uncontaminated area and remove protective clothing. **Do not give victim anything to drink.** Cool victim with cold water, cold compresses, and rapid fanning.

#### **B.2.3.2.5 Additional Heat Stress Considerations**

##### **B.2.3.2.5.1 Thermal Burns**

Additional precautions must be considered when working in areas with considerable solar loads. Black or dark nonreflective surfaces can become extremely hot and may cause burns if contacting to unprotected skin. In addition, wide open dark surfaces, such as asphalt/blacktop parking lots, can create excessive radiant walking surfaces, which, if ignored, can cause profuse foot perspiration and discomfort as well as increase potential for heat stress-related illnesses. When touching potentially hot surfaces, lined or unlined cotton or leather gloves are generally recommended. When working on hot open surfaces, employees may wish to carry additional socks and change them when necessary.

##### **B.2.3.2.5.2 Ultraviolet Radiation**

If unprotected, certain employees not normally acclimated to direct solar radiation are susceptible to severe sunburns. Employees should bring sunscreen (SPF-15) with them if they are particularly prone to burning or if they shall be outside working for a significant amount of time. The hazards of heat stress and thermal/ultraviolet burns can be severe and debilitating. All employees should monitor one another.

### **B.2.3.3 Heat Stress Monitoring**

Heat stress is caused by a number of interacting factors including environmental conditions, clothing, workload, and the individual characteristics of the worker. With the addition of PPE, site workers are potentially a considerable risk for developing heat stress. PPE adds weight and bulk, severely reduces the body's access to normal heat exchange mechanisms (i.e. evaporation, convection, and radiation) and increases energy expenditure. Therefore, regular monitoring and other preventative precautions will be vital to insuring worker safety. Factors that may predispose workers to heat stress include:

- lack of physical fitness
- lack of acclimation
- age
- alcohol and drug use
- disease
- sunburn
- diarrhea

#### **B.2.3.3.1 Monitoring**

Because the occurrence of heat stress depends on a variety of factors, all workers, even those not wearing protective clothing, will be monitored.

For workers wearing permeable clothing (i.e. standard cotton or synthetic work clothes), the American Conference of Governmental Industrial Hygienists Threshold Limit Values and methods will be implemented. Measurements and values will be calculated using the "Wet Bulb Globe Temperature" (WBGT). Currently the WBGT index is the simplest and most suitable technique to measure environmental factors. WBGT values are calculated by the following equations:

1. Outdoors with solar load:

$$WBGT = 07.NWB + 0.2GT + 0.1DB$$

2. Indoors/outdoors with no solar load:

$$WBGT = 0.7NWB + 0.3GT$$

Where: WBGT = Wet Bulb Globe Temperature

NWB = Natural Wet-Bulb Temperature

DB = Dry-Bulb Temperature

GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet bulb thermometer, and a dry-bulb thermometer.

For workers wearing semipermeable or impermeable PPE, the ACGIH standard can not be used. For these situations, workers should be monitored when the temperature in the work zone is above 70°F (21°C). To monitor such workers, the SHSO or their designee will measure:

1. Heart rate. Count the radial pulse during a 30-second period as early as possible once the rest period begins.

If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.

If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

Prior to initiating work, contractors and regular site personnel should submit the worker's age, weight, and any unordinary physical conditions that he/she may possess. The exceedence of 110 beats per minute may be subjective depending on the individuals physical norms.

2. Oral temperature. Use an approved thermometer or similar device to measure the oral temperature at the end of the work period (before drinking).

If the oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.

If oral temperature still exceeds 99.6°F at the beginning of the next rest period, shorten the following work cycle by one-third.

Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F.

3. Body water loss, if possible. Measure body weight on a scale at the beginning and end of each workday to see if enough fluids are being taken to prevent dehydration. Body weight should be measured while the employee is wearing similar clothing or, ideally, when minimal clothing is worn. The body water loss should not exceed 1.5 percent total body weight loss in a workday.

The following table lists the suggested frequency and corresponding temperature for monitoring workers:

**Table 2-2**  
**Suggested Frequency of Physiological Monitoring**  
**for Site Workers**

Adjusting Temperature	Normal Work Clothing	Impermeable Clothing
90 <sup>0</sup> F (32.2 <sup>0</sup> C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5 <sup>0</sup> -90 <sup>0</sup> F (30.8 <sup>0</sup> -32.2 <sup>0</sup> C)	After each 60 minutes of work	After each 30 minutes of work
82.5 <sup>0</sup> -87.5 <sup>0</sup> F (28.1 <sup>0</sup> -30.8 <sup>0</sup> C)	After each 90 minutes of work	After each 60 minutes of work
77.5 <sup>0</sup> -82.5 <sup>0</sup> F (25.3 <sup>0</sup> -28.1 <sup>0</sup> C)	After each 120 minutes of work	After each 90 minutes of work
72.5 <sup>0</sup> -77.5 <sup>0</sup> F (22.5 <sup>0</sup> -25.3 <sup>0</sup> C)	After each 150 minutes of work	After each 120 minutes of work

#### **B.2.4 Biological Hazards**

Biological hazards are living organisms that can cause illness or death to exposed individuals. Plants that elicit allergic skin reactions in sensitive individuals, such as poison ivy, oak and sumac, are such biological hazards and may be present at any site located outdoors. Personnel should avoid stepping in areas where such vegetation may exist. Plastic sheeting can be used to reduce contact with vegetation, if work must be conducted in these areas. Even when not transmitting disease or producing allergic response, insects and other invertebrates can produce painful stings and bites. Bees, wasps, fire ants and biting flies all fall into this category. The presence of flying, biting insects can also produce potentially dangerous field conditions because of the distraction they may cause to site workers.

Common sense can mitigate most biological hazards in field and sampling situations. Insect and invertebrate hazards may be reduced by the use of repellents where appropriate. Extreme care should be taken to avoid air, soil, or water contamination with any repellent. If bee or wasp nests are

encountered when conducting work in a nesting area, the use of a carbon dioxide extinguisher will temporarily incapacitate the insects until the nest can be physically removed using remote mechanical means, such as a long stick or branch. Taping or tying pant legs and shirt sleeves shut lessens ant and tick bite hazards. Plants which may cause allergic reactions in field personnel should be identified and removed or avoided.

### B.3.0 HAZARD ANALYSES

**B.3.1.1 Hazard:** Contact with contaminated soils, groundwater, surface water, sediment, non aqueous phase liquids (NAPL), or dense non-aqueous phase liquids (DNAPL)

**Precautions:**

- Use layered latex and nitrile gloves when handling samples.
- Use layered latex and nitrile gloves when handling heavily contaminated soils.
- Always wear long pants.
- Wash hands thoroughly prior to eating, drinking, smoking, or applying cosmetics.
- If skin contact is made, immediately wash affected part with soap and water.
- Properly dispose of contaminated materials.
- Remove contaminated clothing as soon as possible.
- Always treat all handled materials as if they are contaminated.

**B.3.1.2 Hazard:** Inhalation of Dust or Gases

**Precautions:**

- Containerize contaminated soils immediately.
- Keep sample(s) away from face area. Do not smell sample for evidence of contamination.
- Obtain/use an air purifying respirator, self-contained breathing apparatus or supplied air respirator.

**B.3.1.3 Hazard:** Flying debris

**Precautions:**

- Safety glasses with side shields and hard hats shall be provided and should be worn by all project personnel.

- Personnel shall avoid working in areas that may be affected by flying debris.

**B3.1.4 Hazard:** Inclement weather

**Precautions:**

- Work shall be ceased during thunderstorms with lightning and/or any other severe weather (i.e., tornado, hail, snow, etc).

**B.3.1.5 Hazard:** Traffic control

**Precautions:**

- Contact local authorities (e.g., traffic engineers/street departments) for appropriate safety requirements.
- Operate vehicles at safe speeds especially when working in rough terrain.
- Use cones, blockades, flashing signs, etc. when working near roadways or in high traffic areas.

**B.3.1.6 Hazard:** Noise exposure

**Precautions:**

- Hearing protection shall be provided to employees and shall be worn when levels exceed 85 dBA.

**B.3.1.7 Hazard:** Moving equipment and parts

**Precautions:**

- Steel-toed boots and hard hats are required when working around heavy equipment.
- Protective gloves should be worn when working with tools or equipment which could potentially cut or pinch fingers or hands.

### **B.3.2.1 Surface Water and Sediment Sampling**

#### **B.3.2.2 Hazard:** Skin contact with contaminated media

##### **Precautions:**

- Latex and nitrile gloves shall be worn when sampling surface water. Gloves should be layered to provide greater protection from skin absorption.
- Hands, arms, face, and neck shall be thoroughly washed with soap and water prior to eating, drinking, smoking, or applying cosmetics.
- Areas of skin contacted by visually contaminated media shall be washed with soap and water immediately.
- Care shall be taken to avoid spilling/splashing surface water from the ditch.
- Do not place hands directly into media without proper glove protection.
- Assume that all surface water is contaminated.

#### **B.3.2.3 Hazard:** Inhalation of air contaminants

##### **Precautions:**

- Keep face away from contaminated media to avoid breathing gases that may be emanating from the material.
- Minimize the amount of time that is spent in the vicinity of contamination.
- Avoid smelling surface water or media as a means of determining degree of contamination.
- If any symptoms of overexposure occur, the contractor should stop work immediately and the SHSO shall contact the HSC and Project Coordinator.
- Stay upwind or crosswind of sampling or intrusive activity locations whenever possible.

### **B.3.3 Free Product Recovery**

#### **B.3.3.1 Hazard:** Contact with free product material

##### **Precautions:**

- Free product recovery shall be conducted by the contractor, using their approved standard procedures. Extra precautions shall be taken when conducting free product recovery procedures due to the high potential for direct contact with the contaminant.
- While conducting recovery efforts on the slopes of the ditch, personnel shall wear a safety harness with an attached lanyard. The buddy system shall be implemented at all times when working in the exclusion zone around Williams Ditch.
- Forearm-length nitrile gloves shall be worn. Gloves shall be discarded if any sign of degradation is evident.
- *Saranex* suits and sleeve protectors shall be worn when needed.
- Avoid all skin contact with free product or surface water.
- Any liquid contact with skin shall immediately be followed by a thorough washing and rinsing.
- Hands, arms, neck, and face shall be thoroughly washed prior to eating, drinking, smoking, or applying cosmetics.
- All materials, equipment, etc. shall be decontaminated following use and all PPE properly disposed of in a plastic container. Contaminated clothing should be removed as soon as possible.
- As needed, *Visqueen* shall be placed around the work area to avoid spilling product on ground.

#### **B.3.3.2 Hazard:** Inhalation of VOCs

##### **Precautions:**

- Personnel shall stand upwind of product when possible.

- Personnel shall take breaks away from the contaminated area.
- If any symptoms of overexposure occur (e.g., headache, nausea, etc.), personnel shall immediately leave the recovery area and contact the HSC and/or Project Coordinator.

**B.3.3.3 Hazard:** Fire/explosion

**Precautions:**

- Ignition sources shall be removed from any potentially flammable area.
- Non-intrinsically safe or non-explosion proof electrical devices will **NOT** be used in areas where a potential for fire/explosion exists.

**B.3.3.4 Hazard:** Exposure to soil contaminants

**Precautions:**

- Do not smell soil for evidence of contamination.
- Avoid breathing vapors from excavations with contaminated soil and surface water.
- Keep all ignition sources away from the contaminated area.
- Use appropriate personal hygiene when working around contaminated materials.

**B.3.4 Intrusive Investigations**

**B.3.4.1 Hazard:** Potential Contaminant Release

**Precautions:**

- Work in discrete areas and limit the amount of area open at any one time.
- Conduct ambient air monitoring.
- Conduct air Sampling.
- Provide appropriate spill response materials.
- Assume all residual materials generated are contaminated.

#### **B.3.4.2 Hazard: Heavy Equipment Operation**

##### **Precautions:**

- Wear hard hats and steel-toed boots.
- Stay a safe distance from equipment and be aware of equipment range of motion.
- Equipment should be equipped with backing alarms.
- Maintain eye contact with the operator.

#### **B.3.5 Additional Hazards**

##### **B.3.5.1 Hazard: Traffic Concerns**

##### **Precautions:**

- Be conscious of all personnel on site.
- Do not drive closer than within four feet of the ditch edge.
- Keep vehicle use to a minimum.

##### **B.3.5.2 Hazard: Water/Drowning**

##### **Precautions:**

- Always use the "buddy system".
- Avoid entering water unless necessary.
- PFDs may be required at the discretion of the health and safety coordinator.

**B.3.5.3 Hazard:** Excessive Vegetation

**Precautions:**

- Be conscious of hidden trip hazards.
- Avoid poison ivy, poison sumac, poison oak, mold, and fungi.

**B.3.5.4 Hazard:** Eating, drinking, smoking, or use of tobacco products

**Precautions:**

- To avoid the unnecessary ingestion of hazardous chemicals, the consumption of the above mentioned items in the designated work zones is prohibited.
- Prior to consumption of food or tobacco products all personnel shall properly decon with soap and water.

**B.3.5.5 Hazard:** Unanticipated environmental and/or health and safety considerations

**Precautions:**

- Should any site personnel anticipate or recognize a potential safety or health hazard they should immediately report their concerns to the SHSO, HSC, Project Coordinator, or on-site supervisor.

#### **B.4.0 HAZARD COMMUNICATION AND TRAINING**

Field personnel must be knowledgeable about hazards to which they may be exposed during this project, as required by the OSHA Hazard Communication (HAZCOMM) Standard and the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard. Documentation of worker training records will be kept on-site in an office trailer or in an off-site location proximate to the Site.

A comprehensive Hazard Communication and Training program requires at least the following elements:

- meetings with personnel involved in this project about hazards which may be encountered at the work Site (including contractors, subcontractors, and visiting personnel)
- proper and adequate employee training in required hazard communication and hazardous waste operations and emergency response topics (OSHA 40 Hour Training Course)
- training regarding the understanding of container labeling and required material safety data sheets (MSDSs)
- review of the location of MSDSs and labels for substances found on site (MSDSs can be found in Attachment C)
- review of the site specific HASP and the Hazard Communication program
- a site specific orientation/safety and health session including:
  1. site layout and accessibility
  2. hand signals/communication requirements
  3. safety rules and recognition of potential hazards
  4. personal hygiene
  5. chemical and physical hazards
  6. work hazards
  7. work zones
  8. contingency/emergency planning
  9. air sampling

10. protective equipment
11. traffic rules
12. excavation precautions
13. confined space entry precautions

A representative of each contractor on-site who will be performing work on-site shall be required to drive the route to the nearest hospital as listed in Attachment G, document the time elapsed of travel, record difficulties encountered, note anticipated delay points, and complete a sign-in sheet confirming arrival at the hospital. Training programs shall meet all OSHA or other applicable regulations. Also, safety briefings shall be given daily or as needed by the HSC, the SHSO, or a designee when new or unanticipated activities occur. All on-site personnel required to wear respirators shall be fit tested and instructed in the proper use, cleaning, storage, and limitations of their respirators. A list documenting the date, time and persons attending each health and safety meeting shall be filed with the HSC.

All personnel shall be required to acknowledge their training via the form in Attachment B. Contractors or other on-site visitors must have similar programs in effect prior to entering the Site.

The specific training requirements (for personnel and supervisors/managers at hazardous waste sites) published under 29 CFR 1910.120, Standards for Hazardous Waste Operations and Emergency Response, include:

1. 40 hours of initial training (certified course) plus three days of actual field experience under the direct supervision of a trained, experienced supervisor for general Site personnel
2. 24 hours certified training plus one day direct field experience under a trained supervisor for personnel with occasional, limited on-site tasks who, based on the discretion of the HSC, shall not likely be exposed over a TLV or PEL (e.g., surveyors, equipment operators, etc.)
3. an additional eight hours of specialized training for manager/supervisors in addition to the 40-hour training

## **B.5.0 CONTAMINANT MONITORING**

The purpose of air monitoring is to identify and quantify airborne contaminants in order to:

1. Determine appropriate PPE
2. Define areas where PPE is needed
3. Assess potential health effects of exposure
4. Determine the need for specific medical monitoring

Integrated air monitoring includes both sampling and real-time monitoring. The integrated plan for the site is discussed in the following sections.

### **B.5.1 Site Ambient Air Monitoring**

The SHSO or other party designated by the Project Coordinator shall be responsible for all on-site air monitoring. This monitoring shall in many cases be real time (direct reading) in nature due to the constantly changing conditions that may be encountered during site work. Air monitoring shall be conducted at regular intervals for the following parameters as removal activities dictate:

1. semi-volatile and volatile organics
2. dust, particulate matter (PM-10) - as required by activity
3. oxygen content (for confined space conditions)
4. flammable or explosive atmospheres, and as necessary
5. toxic substances (hydrogen sulfide, hydrogen cyanide, etc.)

During intrusive activities, air monitoring should be continuous and include real-time measurements for both volatile and semi-volatile vapors.

Appropriate equipment to measure air temperature, wind speed, wind direction, barometric pressure and relative humidity will be available on-site. In addition, a nearby local television station may have meteorological data. Data will be recorded by the SHSO or his designee on a daily basis and kept on-site or at an off-site location proximate to the Site.

#### **B.5.1.1 Oxygen Meter**

Oxygen content should be measured as percent oxygen in air with 20.8 percent being normal. Oxygen levels below 19.5 percent or above 23.5 percent are considered hazardous. It is important to note that when oxygen levels are below 19.5 percent, LEL readings shall be inaccurate.

#### **B.5.1.2 Combustible Gas Indicator**

With regard to flammable or explosive atmospheres, concentrations are measured with a combustible gas indicator (CGI) as "percent of the lower explosive limit" or percent LEL. While levels in the range of zero percent to twenty percent of the LEL are normally considered safe, ten percent LEL shall be the action level as an increased safety factor. It should be noted that organic vapors can still be present above safe level at the ten percent LEL Level. A low LEL reading should not be interpreted as a safe condition in other terms of potential health effects to exposed, unprotected personnel. Also, if CGI readings exceed that of the lower explosive limit, a zero meter reading shall be observed. If a high concentration of gas (i.e., a concentration above the LEL) is suspected, a percent gas meter with an extended sampling probe in which the area can be monitored from a remote, safe area must be used to verify the presence of a combustible/non-combustible atmosphere.

#### **B.5.1.3 Personal Air Samplers**

Personal air sampling devices such as badges or personal pumps will be used periodically during critical operations in which there is the potential to expose gross creosote-related contamination to the atmosphere.

#### **B.5.1.4 Perimeter Air Monitoring Stations**

With regard to the safety of the public during site activities, four fixed air monitoring stations will be strategically placed around the circumference of the site. Depending on the results of the baseline air sampling event, weather conditions and remedial activities, additional locations proximate to buildings downwind of excavation activities may be established. Taking into account changing weather patterns (i.e., wind direction) air monitor shall be adjusted/repositioned, as needed, in order to achieve the most representative and accurate sample. A combination of real-time monitoring and sampling for target compounds, and particulates will be used. This is more fully explained in Section B. 5.5, Air Sampling Program.

#### **B.5.1.5 Photoionization /Flame Ionization Detector**

Exposures to toxic substances in air shall be monitored on a regular basis during the anticipated site activity. Hand held direct reading monitors, such as a *HNu* or ToxiRAE photoionization detectors (PID), shall be utilized to sample for volatile, toxic organic substances. Exposure to toxic gases shall be kept at a minimum. Action levels for volatile organic compounds using a PID are provided in Table 5-1. These levels are conservative and take into account that many direct reading detectors, such as the PID, detect total organics and cannot differentiate between compounds. Also, the action level takes into account that a PID meter reading may not reflect the actual concentration of contaminants present in parts per million (ppm). Rather the actual concentration present may be significantly greater than the observed reading. A LEL/O<sub>2</sub> meter should be used to detect flammable atmospheres and to estimate the amount of gas present. A Flame Ionization Detector (FID) such as manufactured by Photovac will also be used near intrusive activities to provide direct reading capability for the less volatile compounds. A PID/FID will also be used to periodically monitor at perimeter air sampling stations to correlate direct readings with analytical results.

**TABLE 5-1**  
**HAZARD MONITORING METHODS, ACTION LEVELS AND PROTECTIVE MEASURES**

<b>Hazard</b>	<b>Monitoring Method</b>	<b>Action Level</b>	<b>Monitoring Schedule</b>	<b>Protective Measures</b>
Organic Vapors/Semi-Volatile Organic Vapors	HNU with 10.6 probe or greater cV probe (calibrated to Benzene)/FID (Photovac, Foxboro, etc.)	<p>Sustained reading above background in the site worker's breathing zone.</p> <p>&gt;5 ppm above background in the site worker's breathing zone.</p> <p>*After the implementation of engineering controls</p>	<p>Continuing working and monitoring.</p> <p>Cease work and reassess site conditions; upgrade PPE.</p>	<p>Level C</p> <p>Level B</p>
Explosion	CGI	<p>0-10% LEL</p> <p>10-20% LEL</p> <p>≥ 20% LEL</p>	<p>Continue investigation.</p> <p>Continue monitoring with caution as higher levels are encountered. Revoke Hot Work Permit. Stop all "hot work" in progress.</p> <p>Explosion hazard – withdraw from area immediately, and contact SHSO, a reassessment of site conditions may be necessary.</p>	<p>Level of site PPE</p> <p>Evacuate Area</p>
Oxygen Deficiency	Oxygen Meter	<p>&lt;19.5%</p> <p>19.5%-23.5%</p> <p>&gt;23.5%</p>	<p>Cease all operations and leave work area; contact HSC or SHSO.</p> <p>Continue work; deviation from normal level may be due to the presence of other substances.</p> <p>Cease all operations and leave work area; contact HSC or SHSO; potential fire hazard may exist.</p>	<p>No Entry</p> <p>Continued Monitoring Level of PPE</p> <p>Evacuate Area</p>

### **B.5.2 Frequencies and Locations**

Frequencies and locations of monitoring shall be determined using a common sense approach by the SHSO in conjunction with the HSC, on an as needed basis. The SHSO will consider the nature and extent of site activities, weather conditions, and exposure potential for workers and/or the public. A more detailed discussion is provided in Section 5.5.

### **B.5.3 Action Levels**

The levels of protection and action levels for personnel safety for organic vapors (volatiles and semi-volatiles), combustible gases, and oxygen deficiency are outlined in Table 5-1. Until additional data is gathered regarding surficial soil contaminants and physical characteristics, and background ambient air quality is established, no visible emissions constitute the action level. The action level can be adjusted accordingly once additional data is available. For all intrusive activities, work shall begin in Level C. Limits on fugitive dust at the perimeter are initially set to no visible emissions. It is anticipated that some site work, including free product recovery, surface water and sediment sampling, and CPT/LIF borings, will be conducted in Level D environments unless conditions warrant increased personal protective equipment. Air monitoring may indicate the need for a higher level of protection. Action levels may be revised by the HSC to reflect changing conditions and additional air monitoring data. Changes in the action levels may only be instituted by the HSC through the SHSO. Field personnel shall be notified of any changes and the health and safety plan amended accordingly. Action levels are subject to modification pending review of background and worst case air quality data, and after direct read instrumentation has been correlated with analytical results

Derivation of Action Levels:

**Perimeter:** Considerations include the following:

1. Off-site receptors are most likely industrial workers at nearby businesses, and transient visitors at the various businesses (delivery, salespeople, etc.). A normal 40-hour work week is assumed. Exposure would be intermittent, lasting less than one hour.
2. Extent of active, open excavation or dredging, if any, will be limited to discrete working areas.
3. Duration of active, open excavation or dredging, if any, will likely occur over a relatively short cumulative time period of three to six months. Activities will most likely be conducted in eight to ten hour shifts.
4. Activities most likely to generate airborne contaminants include test pits, hollow stem borings, excavation, dredging, heavy equipment movement, soil stockpiling, and materials handling. Active emissions control techniques are assumed.
5. Prevailing winds are from the southwest or west southwest, according to historical climatological data.
6. Potential contaminants, based on available data, are primarily PAH's, both in vapor phase and absorbed to particulate matter. Diesel fuel is suspected of being used as a carrier for creosotes and as such benzene compounds may be present.
7. The site is bordered on the south (generally upwind), by a regularly used rail corridor. Heavy urban traffic usage occurs west of the site during the standard workweek.
8. Lacking site-specific air monitoring data-short-term action levels at the perimeter are based on the PEL/100.

Once initial data regarding specific contaminants are obtained, action levels and/or means of sampling or monitoring may be modified.

**Work Area:**

1. Activities that are most likely to generate airborne contaminants include test pits, hollow stem borings, excavation, dredging, heavy equipment movement, soil stockpiling, and material handling.
2. Workers closest to active work areas during intrusive activities will have continuous air monitoring, personal air sampling and appropriate PPE.
3. Levels are based on lowest available published data regarding potentially respirable contaminants expected to be in the worker's breathing zone and are consistent with US EPA guidelines.

**B.5.4 Personnel Monitoring**

Personnel sampling in work zones will be performed according to the following schedule:

Air Monitoring Frequency\*:           PID – Every 15 minutes  
  FID – Every 15 minutes

\*Real-time monitoring in work areas will be conducted every fifteen minutes or when work begins on a different portion of the site, new contaminants are found on the site, a different type of operation is initiated, or when work involves immediate contact with a suspected medium of contamination.

Personal Sampling:   Organic vapor badge (each worker) – SKC Charcoal or equal  
                                  High volume sampler with Teflon Filter (high risk employees – one per work group) or equal.

\*Personal air sampling will be conducted in conjunction with real-time assessments to document potential worker exposure and assess potential hazards in the work zone relative to action levels.

Oxygen Meter: As dictated by confined space entry or work between or around heavy equipment.

Carbon Monoxide Meter: As dictated by work between or around heavy equipment.

Explosive/Combustible Meter: As dictated by confined space entry.

#### **B.5.5 Air Monitoring Program**

The primary objectives of conducting an air sampling program at this site are to:

1. Verify that personnel are adequately protected during intrusive activities which may expose gross creosote-related contamination to the atmosphere.
2. Protect the health or welfare of the public.
3. Provide a database to quantitatively document exposure potential to airborne contaminants.

Air sampling will be performed to take into consideration the expected contaminants which may be released during the following intrusive removal activities:

1. Excavation or removal of contaminated sediment in Williams Ditch.
2. Excavation or removal of gross creosote-related contamination in areas other than Williams Ditch.
3. Hollow-stem auger work in areas of suspected gross creosote-related contamination.
4. Test pits in areas of suspected gross creosote-related contamination.

The following protocol will be used to meet the objectives of the air monitoring/sampling program.

1. Collection of background air quality samples
2. Collection of representative worst case air quality samples
3. Reassessment of PPE requirements and initial work area/perimeter action levels

4. Modifications to the Health & Safety Plan and integrated air monitoring program as necessary.
5. Implementation of an integrated air monitoring program.

Each of these components are described below:

1. Urban background samples will be collected upwind and downwind of the suspected lagoon area and Williams Ditch on two separate occasions prior to initiating intrusive activities to establish a general baseline of ambient air quality at the Site. The suspected lagoon area and Williams Ditch are selected as target source areas since the potential for exposing gross creosote-related contamination is greatest in those areas. Four stations, set up to gather data on SVOC's , VOC's and particulates (PM<sub>10</sub>) will be established. *Summa* canisters and high volume sample(s) with resin filters or a PUF sampler will be used. Samples will be collected over a 24-hour period on two separate occasions.
2. A worst case air sample will be collected adjacent to a test pit excavated in the suspected lagoon area, where gross creosote-related contamination is likely to be encountered. The sample collection time is between fifteen minutes and one hour. *Summa* canisters will be used to collect a sample for Volatile Organics (TO-14) analyses and the method adjusted to pick up residual SVOC's (i.e. naphthalene) which may be in the canister. Three downwind stations located proximate to downwind receptors will be set up with *Summa* canisters and appropriate *FID/PID* equipment. A data logger or strip chart will be used with the portable instruments. A high volume sampler with resin filters or a PUF sampler will run prior to, during and after the test pit activity, both upwind and downwind. Concurrent with sample collection, ambient air measurements using an *FID* and a *PID* will be conducted at various locations around the perimeter of the excavation. While the air samples are being collected, documentation regarding the range of readings relative to the position around the excavation will be made. Level C PPE will

be used for this activity. Upgrade to Level B if air monitoring suggests it is necessary. Any excavated material will be placed back into the excavation. One upwind sample location will be selected and a similar sample collected.

3. Data collected in the second step of the integrated air monitoring program will be used to reassess PPE requirements and the initial perimeter action levels. The data will be incorporated into an emissions model to estimate a range of potential contaminant migration patterns from exposed work areas under various weather conditions and to predict ambient air impact. Secondly, using the analytical data and the results of the air modeling, initial perimeter action levels and sampling methods will be reassessed considering the items described in Section 5.1.
4. Prepare any necessary modifications to the Health and Safety Plan and/or the integrated air monitoring program to reflect predicted ambient air impacts.
5. During intrusive activities, personnel working in the exclusion zones will be required to wear personal air sampling device(s) during critical phases of the project which may expose gross creosote-related contamination. Regular air monitoring, using hand held direct-read instruments, will be conducted immediately adjacent to intrusive activities and around the perimeter at the site. Depending on the contaminants detected in step 2 and the selected remedial alternative, high volume personal air samplers, dual media devices and/or *Summa* canisters will also be positioned at the perimeter of the site near occupied building(s) immediately proximate to the work area to document potential contaminant levels beyond the immediate work zone. Sampling will occur until a correlation between FID/PID measurements is established and hand-held instrumentation is deemed reliable in detecting contaminants. These locations may change based on changing weather and site conditions. When direct ambient air sampling is being conducted, the sampler shall monitor the entire radius of the working area for signs of contamination on a regular basis as well as at the perimeter sampling stations.

The proposed activities listed below and the appropriate measures to be taken after the initial background samples are as follows:

1. Routine daily non-intrusive site activities such as a general site inspection: periodic perimeter air monitoring. Background sampling will occur during routine activities.
2. Daily product recovery: periodic perimeter air monitoring
3. Sediment sampling: direct ambient air monitoring in the breathing zone with an FID and a PID.
4. Surface water sampling: direct ambient air monitoring in the breathing zone with an FID and a PID.
5. Intrusive site activities: direct ambient air monitoring in the breathing zone with an FID and PID, perimeter air monitoring/sampling and personal air sampling. An oxygen meter and carbon monoxide meter will be available during periods of heavy equipment usage.
6. Backhoe test pits will be done in areas of varying levels of creosote-related contamination. Operators and personnel on the ground will remain upwind to the maximum extent practical. Direct ambient air monitoring with an FID and PID, personal air sampling, and perimeter monitoring/sampling, depending upon level of contamination.
7. Cone Penetrometer Testing: periodic ambient air monitoring in the breathing zone with a FID and PID.

It should be noted that all sampling will be conducted in the workers breathing zone to obtain the most representative sample. Samplers staged at the perimeter of the site should also be located

near the breathing zone. When personal samplers are attached to personnel being sampled during site activities, one representative sample shall be taken from each work group (i.e., technicians, operators etc.) working in the same general proximity.

## **B.6.0 SAFETY CONSIDERATIONS**

### **B.6.1 General Safety Guidelines**

All personnel will be expected to adhere to the safety practices for their respective tasks. Personnel shall also exercise caution when working in adverse weather, on rough or slippery terrain, when operating on or around machinery, and when vision and mobility are impaired due to use of protective gear. It is also important that the integrity of protective clothing be maintained and personnel realize the increased difficulty in communicating when wearing a respirator (if use is necessary). The following should be noted:

1. In unknown situations, always assume the worst and plan responses accordingly.
2. Use the buddy system; establish and maintain communication by use of hand signals, radios or other means, as necessary.
3. Minimize contact with excavated or other potentially hazardous materials or liquids. Do not place equipment on tanks, drums, or the ground. Never sit or climb on tanks, drums, or other vessels and containers.
4. Use disposable protective items when possible to minimize risks during work.
5. Smoking, eating, or drinking is not allowed after entering the work zone and before personal decontamination. Hands should always be washed prior to smoking, eating, or drinking.
6. Work breaks should be planned to prevent stress related accidents, fatigue, or heat or cold stress symptoms.
7. Conflicting situations between work requirements and safety procedures must be resolved by HSC and/or SHSO.
8. Unauthorized breaches of specified safety protocol will not be tolerated. Personnel unwilling to comply with established safety procedures will not be allowed to continue to work at the Site.
9. Be observant of the surroundings and also of others. Extra precautions are necessary when using protective gear due to reduced vision and hearing.

10. Use of contact lenses by personnel are not allowed during any activities when using respirators or when in areas where irritating gases may become trapped underneath lenses.
11. Wearing a respirator shall require the removal of all facial hair except small mustaches that are within the sealing surface of the respirator.
12. Changes in contingency plans shall be posted to notify all personnel of any modifications to safety protocols related to changing Site conditions.
13. No open flames shall be allowed inside the exclusion zone (i.e., smoking). Intrinsically safe or explosion proof equipment shall be used in potentially explosive atmospheres.
14. When in doubt, withdraw and reassess when encountering any potentially hazardous situation.
15. Be aware that chemical constituents may mimic or enhance symptoms of other illnesses or intoxication.
16. The SHSO shall maintain a log of meetings, facts, incidents, data, etc. relating to the project. Records shall remain at the Site for the duration of the project, if feasible.
17. Observance of applicable OSHA, EPA, general health and safety, and specific equipment use practices is mandatory.

## **B.6.2 Work Zones**

### **B.6.2.1 Heavy Equipment/Drilling Operations**

All intrusive phases of work are anticipated to be initiated in Level C personnel protective equipment. However, the Site shall maintain designated work zones to provide for the general safety of personnel. A safe radius as defined by the SHSO or HSC shall be maintained around any drilling equipment, field study equipment, or other heavy equipment. Only required personnel shall be in the immediate proximity of operating equipment.

#### **B.6.2.2 General Work Zones**

During project operations, the Site shall be divided into three zones: These zones are the exclusion zone, contamination reduction zone (CRZ), and support zone. The exclusion zone is the immediate work area where possible exposure to contaminants may occur and where tasks such as sampling, air monitoring etc. are conducted. In this case, the exclusion zone shall consist of the ditch, ditch bank, or any other immediate source of contamination where work is being conducted. The exclusion zone shall be marked with plastic barrier tape attached to stanchions to prohibit unauthorized, untrained individuals from entering the potentially hazardous area. The CRZ shall consist of an area where personnel from the exclusion zone shall enter to discard their equipment and disposable PPE and where decontamination shall take place prior to entering the support zone. If Level C PPE is warranted and approved, the CRZ shall serve as a PPE doffing area. The support zone shall be located outside the CRZ and the exclusion zone. The support zone is an area where Level D personnel protective gear is required and Level C and Level B gear is immediately available. In this area there should be no exposure to potential contamination.

#### **B.6.2.3 Site Control**

A site control point will be established when the proper security fencing is in place.

The SHSO or his designee will be responsible for verifying, at a minimum, the identity of personnel entering the secured area, confirming a reason for entry, and verifying personnel are familiar with potential site hazards. A visitors log will be kept on-site documenting the name, affiliation, reason for visit, time in, time out, and acknowledgement of hazard briefing.

### **B.6.3 Permit-Required Confined Spaces**

The nature of this project and investigative techniques should not require personnel to enter confined spaces such as manholes, sewers, tanks, excavations, etc. Personnel are prohibited from entering confined spaces during the course of this project unless specifically authorized by the HSC or SHSO.

If during the project it is apparent that entry into a permit-required confined space (PRCS) is necessary, the HSC shall be informed and the proper PRCS procedures including an entry permit system shall be implemented. Only the HSC or SHSO can determine whether or not a confined space is a PRCS and can authorize entry. Details regarding entry into a PRCS and permit forms are located in Attachment D.

### **B.6.4 Trenching and Excavation**

As trenching and excavating may be a necessary activity in this project, it shall be conducted in a safe manner and according to all applicable regulations.

The appropriate standard is 29 CFR Part 1926, Subpart P, and became dated FEBRUARY 5, 1990. A summary of applicable guidelines and a copy of the new regulations can be found in Attachment E.

### **B.6.5 Lockout/Tagout**

Working with electrically energized equipment (e.g., pumps, controls, fans, etc.) or other equipment where energy can be stored and subsequently released poses the need for unique safety considerations. Such considerations should be part of an overall energy release control program sometimes called lockout/tagout, which can be found in Attachment F.

## **B.7.0 COMMUNICATIONS**

### **B.7.1 Off-Site Communications**

Communications between on-site and off-site personnel may be maintained by the following:

1. Public Pay Telephone - Public pay telephones may be located near the Site.
2. Portable Telephone - A cellular telephone shall be located in the project area or in the nearest vehicle.
3. Radio - The selected contractor may maintain two way radio communication with a central dispatcher.

### **B.7.2 On-Site Communications**

The Contractor performing the removal action may maintain communications between on-site personnel by using portable two-way radios. If no portable radios are used, hand or voice signals shall be used to communicate between personnel on-site. The following hand signals shall be used when hearing is a problem:

- |  |    |                               |
|--|----|-------------------------------|
| 1. <u>Hands on Throat</u>                          | -- | Out of Air.                   |
| 2. <u>Grip partners wrist<br/>or hands on hips</u> | -- | Leave area immediately.       |
| 3. <u>Thumbs up</u>                                | -- | OK; I'm alright.              |
| 4. <u>Thumbs down</u>                              | -- | Negative; there is a problem. |

### **B.7.3 Emergency Situations**

A hand-held air horn or similar means of communication shall be available on-site to alert personnel in the event of an emergency situation. Once the emergency signal has been given, the designated evacuation procedures as discussed in section 10.0 shall be followed.

## **B.8.0 PERSONNEL PROTECTIVE SAFETY GEAR**

### **B.8.1 Level D Protection**

If conditions permit, all work on this project shall be conducted in Level D personnel protective safety gear consisting of:

1. coveralls (disposable coveralls may be desirable)
2. safety boots (if applicable) or sturdy, slip-resistant shoes
3. safety glasses or goggles (if liquid splash hazard exists)
4. hard hat
5. work gloves (chemical resistant when contact with contamination is anticipated)
6. ear protection for personnel on/around heavy equipment, etc.
7. saranex or poly-tyvek suits and latex and nitrile gloves and booties shall be worn when working in the exclusion zone
8. steel-toed boots

### **B.8.2 Level C Protection**

All intrusive activities shall be initiated using Level C personnel protective safety gear. If sustained Level C work is deemed mandatory and authorized by the HSC or SHSO, equipment shall include:

1. full-face air purifying respirators equipped with combination organic vapor/HEPA particulate cartridges
2. chemical resistant clothing, one piece, long sleeved and hooded
3. outer nitrile work gloves and latex undergloves
4. chemical resistant outer boots and inner disposable booties
5. hard hat
6. hearing protection for personnel on/around the drill rig or heavy equipment

7. steel-toed boots

Boots and gloves shall be taped to chemical resistant coveralls.

### **B.8.3 Level B Protection**

It is anticipated that all work shall be performed using Level C or Level D personnel protective safety gear. If air monitoring requires, or an emergency situation should arise, Level B personnel protective safety gear shall be used when authorized by the HSC or SHSO, the equipment shall consist of:

1. a pressure demand self contained breathing apparatus (SCBA)
2. chemical resistant clothing, one piece, long sleeved and hooded
3. outer nitrile work gloves and dual inner latex gloves
4. chemical resistant outer boots and inner disposable booties
5. hard hat
6. hearing protection for personnel on/around the drill rig or heavy equipment
7. steel-toed boots

**NOTE:** No personnel shall be allowed to wear a respirator when facial hair interferes with the seal. Also, all personnel shall be individually qualitatively or quantitatively fit tested for their respirator before the job begins according to OSHA protocol and/or provide the proper documentation that a fit test has been conducted.

Initially, administrative and engineering controls shall be implemented to reduce exposure potential.

Precautions such as working upwind of potentially contaminated areas, prohibiting personnel from working in these areas, and sampling from remote locations shall be used to eliminate potential exposure hazards. If controls cannot reduce hazards below PELs or TLVs, whichever is lower, then Level B PPE will be required in areas with elevated exposure concentrations or work terminated until the hazard can be fully assessed or mitigated.

## **B.9.0 DECONTAMINATION AND CLEANUP PROCEDURES**

### **B.9.1 Personnel Decontamination**

Decontamination shall be carried out by all personnel leaving the exclusion zone. Under no circumstances, except for emergency evacuation or medical emergencies, shall contaminated personnel or equipment be allowed to leave the contamination reduction zone without following proper decontamination procedures. The following procedures, shall be performed:

1. Tools, air monitoring instrumentation, sampling equipment, and trash shall be placed at designated stations (stations shall contain designated containers for depositing trash and plastic sheeting for placing equipment and instruments prior to decontaminating ).
2. Outer gloves and boots shall be removed.
3. Tape and boots shall be removed.
4. Outer gloves shall be removed and placed in a designated container.
5. Hard hat shall be removed.
6. Outer garments shall be removed and discarded in a designated container.
7. Inner gloves shall be removed and placed in a designated container
8. Respirator shall be removed and placed in a designated area, if needed.

Because some workers may not be entering the exclusion zone, personnel decontamination procedures shall consist only of placing used chemical-resistant gloves in a plastic container and washing hands thoroughly prior to eating, drinking, or smoking.

### **B.9.2 Equipment Decontamination**

Equipment decontamination shall be conducted in a manner that assures all contaminants remain on-site and potentially contaminated equipment/materials are properly stored (e.g., overpack drums, plastic containers, etc.). Decontamination of large equipment shall occur in a designated area within the contamination reduction zone or the outer most section of the exclusion zone if feasible. Decontamination of sampling equipment or other small equipment shall be conducted in each individual working area within the exclusion zone.

Monitoring equipment shall be protected from contamination as much as possible. This may be done by storing instruments in a background area, draping with plastic, or covering instruments with plastic bags so as not to hinder operation. After sampling completion, covers shall be disposed of and the instruments internally purged and cleaned with disposable paper towels.

Respirators shall be cleaned daily with respirator disinfectant, alcohol, or other appropriate disinfecting solution, such as wetted paper wipes. At the beginning of each day, respirators shall be inspected for possible disfunction or leaks, repaired as necessary, and re-assembled. New respirator cartridges shall be installed as needed or when breakthrough is suspected. Each person shall be responsible for his or her own respirator adjustments and care. Decontamination of larger equipment (e.g., trucks, drilling rigs, etc.) is discussed in section 12.0 of this document.

If heavy equipment becomes contaminated with waste while cutting or drilling, the waste shall be removed with a shovel or trowel in a safe manner.

### **B.9.3 Site Cleanup**

The SHSO and/or Project Coordinator shall ensure that the Site is left in a clean and orderly condition. All disposable clothing, excess materials, and other debris shall be properly containerized and removed from the Site unless it is contaminated. All contaminated materials shall be properly managed and disposed of accordingly after appropriate characterization.

## **B.10.0 EMERGENCY RESPONSE**

### **B.10.1 General**

Some of the potential emergencies associated with this project include areas containing hazardous vapors, heavy equipment (e.g., excavator, etc.) related accidents, exposure to temperature extremes, accidents associated with various hand tools or sampling equipment, working around contaminated media, working near excavations and a body of water, and working where potential for slips and falls exists.

It is anticipated that unless air monitoring indicates otherwise, all work shall be performed using Level C or Level D protection. Work areas shall be restricted as discussed in Section 6.0. Exclusion zones shall be used for all work to prevent unauthorized, untrained individuals from entering work areas. Individual zones may be used for convenience to properly segregate operations and keep unauthorized personnel out of work areas. If a hazardous level of air contaminants exists or accidentally occurs, personnel shall leave the work area in the upwind direction, if possible.

All personnel injuries, regardless of severity, shall be reported to the HSC and SHSO as soon as possible. If the injury is minor and does not require off-site treatment, first aid can be administered and the SHSO shall determine if the victim can continue working. If the injury requires medical attention, the individual shall receive immediate care. The HSC will be notified and the proper procedures shall be conducted. The required accident/injury reporting forms shall also be completed.

### **B.10.2 Medical Emergency**

Medical emergency information is included in Attachment G and consists of written directions to the hospital, a map, and emergency phone numbers. These numbers and the map will be posted at a designated location on site such as a vehicle and/or office trailer at the work site. In the case of a serious injury, an ambulance or emergency medical service shall be summoned via the portable telephone. A company vehicle with appropriate first aid supplies should always be on-site for less serious injuries.

### **B.10.3 Typical First Aid Procedures for Chemical Exposure**

#### **B.10.3.1 Inhalation**

1. remove victim from toxic atmosphere
2. clear airway
3. immediately contact supervisor
4. seek medical attention

#### **B.10.3.2 Skin/Eye Contact**

1. remove clothing where chemical has spilled
2. skin contact - flush area for 15-30 minutes
3. deep skin burns - flush area for 15-30 minutes
4. eye splashes - flush area for 15-30 minutes
5. cover the burns with a dressing
6. immediately contact supervisor
7. seek medical attention

#### **B.10.3.3 Ingestion**

1. immediately contact supervisor
2. follow instruction listed on MSDSs or label

In all the above cases, the MSDS or label information should be checked for more specific first aid information. **If exposure is suspected and exposure symptoms exist, prompt medical attention for victim shall be obtained immediately.**

#### **B.10.4 Fire Prevention/Emergency Response**

Standard fire prevention techniques shall be utilized in addition to those afforded by the local fire department including:

1. locating portable fire extinguishers in appropriate vehicles, out-buildings and major site work areas (e.g., excavations). In an area where the possibility of a flammable atmosphere exists, a fire extinguisher should be located in the nearest building or vehicle.
2. designating fire and emergency routes (primary and alternate) for all unique work areas
3. instructing personnel on fire and emergency contingencies at pre-construction meetings and other safety training sessions, including the use of fire extinguishers
4. implementing communication protocols detailed in Section 7.0 of this HASP
5. posting emergency numbers and routes at an easily accessible location

#### **B.10.5 Categories of Potential Incidents – Preliminary Contingency Plan**

##### **B.10.5.1 Emergency Notification and Contingency Procedures**

In the event of an accident or chemical release at the site, the individual(s) involved in the incident should take any reasonable precautions to mitigate immediate harm to themselves, other persons, or the public. The SHSO should, if necessary, immediately sound an evacuation alarm and contact the Project Coordinator followed by the HSC. The SHSO and/or his on-site designee should utilize this contingency plan in order to make the proper outside emergency notifications according to the matrix included in this section. Individuals who may be charged with the responsibility of making the proper outside contacts should be familiar with the contingency plan for a particular type of incident.

Upon appropriate notification of the emergency personnel, the SHSO shall notify, in order of priority the following individuals:

1. Project Coordinator
2. HSC
3. SHSO's Immediate Supervisor (if different than the HSC)

The Project Coordinator or his designee will be responsible for dissemination of information to the public or media. Prior to initiating intrusive removal activities, a meeting or telephone consultation with the appropriate local emergency response personnel and pertinent local government agencies will be conducted by the Project Coordinator or his designee and the HSC to brief them on site hazards and potential response requirements. The capabilities and response mechanisms of each potential responder shall be identified and documented. The contingency plan will be modified or revised to reflect changes and disseminated to each potential responder. Periodic updates of site activities, (i.e., when initiating a new or different types of work) will be distributed to potential responders by the Project Coordinator or his designee.

**CATEGORIES OF POTENTIAL INCIDENTS  
PRELIMINARY CONTINGENCY PLAN  
TABLE 10-1**

<b>Event</b>	<b>Incident Response Procedure</b>
Fire	1. Call 911
Explosion	1. Evacuate area, Call 911
Minor On-site Chemical Release	1. Isolate spill area 2. Verify that no immediate health hazards exist 3. Take proper precautions to clean up and dispose of contaminated material in accordance with all applicable federal, state, and local regulations
Reportable Chemical Release	1. Isolate spill area and contain the spill as best as possible 2. Contact the environmental response contractor if needed (Heritage Environmental) 3. Call the USEPA, SERC, LEPC, City of Toledo Environmental Services
Personal Injury	1. Call 911 or transport to Hospital if injury is minor 2. Take proper first-aid precautions and immobilize the injured
Theft / Trespass / Sabotage	1. Call the Police 2. Secure site and verify that no immediate hazards exist for personnel on-site or the public adjacent to the site 3. Take any precautions to minimize the risk to the public and personnel
Break a Utilities Line in Excavation	1. Call 911 if an immediate hazard (from a gas line for example) exists 2. Otherwise notify OUPS and proper utility company to address the situation or the City of Toledo Environmental Services if the utility involved is a water or sewer line

## **B.11.0 MEDICAL SURVEILLANCE**

### **B.11.1 General**

Personnel of various contractors shall be working at this site. According to OSHA employers are responsible for their own employees, regardless of the prime contractors, subcontractors, or site owners involved in the project. All employers whose employees may potentially be exposed to waste materials, hazardous materials, or other occupational hazards, shall establish a medical surveillance program for their employees in accordance with the requirements of 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response) and other applicable regulations.

Contractors may be asked to verify that their employees are currently under an occupational medical monitoring program.

## **B.12.0 SITE MANAGEMENT**

### **B.12.1 Control of Contaminated Materials**

Contaminated materials that may be generated include, but are not necessarily limited to, decontamination solutions, disposable equipment (e.g., protective clothing), contaminated purge water, material collected from a backhoe, etc. Circumstances which may result in these materials being distributed throughout the Site include:

1. contaminated soils adhering to heavy equipment and personnel
2. conveyance via airborne particulates generated from site activities
3. uncontrolled stormwater or wash water spreading contaminated materials and surface water to other areas
4. spills from containers during transport or transfer

#### **B.12.1.1 Personnel Protective Equipment**

If personnel are exposed to airborne contaminant levels exceeding sustained background levels as determined with flame ionization detectors, photoionization detectors, OVAs, a portable GC, etc., or if there is potential for contaminated material to be splashed on personnel, disposable protective clothing shall be designated as contaminated and shall be disposed of properly after use. Contaminated clothing and disposable personnel protective equipment shall be placed in plastic bags. The plastic bags shall be stored in drums and properly staged until disposal arrangements are made.

#### **B.12.1.2 Equipment Decontamination**

Backhoes, trucks, drill rigs, containers, and other heavy equipment shall be free of any soils, sludge, or other debris before leaving the contamination reduction zone. A high pressure steam sprayer may be used to decontaminate those pieces of equipment directly in contact with contaminated media. A high pressure steam sprayer may be used to decontaminate equipment before entering or leaving the Site.

### **B.12.2 Traffic Control**

Heavy equipment, drill rigs, personal/company vehicles, and other equipment shall follow specific traffic rules. Pedestrians at the Site shall be given the right-of-way and shall be avoided by heavy equipment operators. Minimum traffic speeds shall be maintained around the site to avoid excess generation and to provide safety to pedestrians and equipment operators. Areas where heavy equipment is operating shall be avoided by unauthorized personnel.

### **B.12.3 Personnel Control**

The SHSOs shall retain a daily sign-in log for all personnel and visitors at the Site, which shall record the date, firm, reason for visit, and name.

## **ATTACHMENT A**

### **Quick Reference Guide for Field Personnel**

## QUICK REFERENCE GUIDE FOR FIELD PERSONNEL

### **1.0 Introduction**

This quick reference guide is designed to be used independently of the HASP and to convey the most important and most used portions of the HASP to field personnel. It is not intended to replace the HASP, which must be kept at the Site for review, acknowledgement and reference at all times. The entire HASP must be reviewed thoroughly by all applicable personnel as part of the training requirements. This guide shall augment and highlight specific engineering, administrative, and protective provisions made to ensure the safe and healthful execution of this project.

### **2.0 Physical Hazards**

#### **2.1 Key Concerns and Items to Remember**

Always be alert to symptoms of **COLD** or **HEAT STRESS**. Know the symptoms and remedies for frostbite, hypothermia, heat rash, heat cramps, heat exhaustion, and heat stroke.

- Don't warm cold body parts in hot water or snow, use lukewarm water only.
- Keep victim calm.
- In hot environments, drink 1/2 glass of water every 15 minutes for cases of heat cramps or heat exhaustion.
- Take periodic rest breaks.
- Consult physician or transport victim to hospital if a possibility exists that frostbite, hypothermia, or heat stroke has occurred.

When working around the following conditions:

- Slippery, rough, snow, or ice covered surfaces - Wear appropriate slip-resistant foot gear and take extra precautions. Also, watch out for vehicles and traffic around the Site and for entrance and exit areas.

- Drilling or heavy equipment - Always be alert to equipment locations and potentially dangerous situations. Keep unnecessary personnel a safe distance from the drilling location and outside the operating envelope of heavy equipment.

Always remember:

- Avoid contact with potentially contaminated soils, liquids, etc. If contact is required to collect samples, the appropriate type of gloves should be worn.
- Use the buddy system. Be alert to any potential hazards.
- Assume the worst and plan accordingly when approaching unknown situations. Withdraw from suspected hazardous situations and reassess the situation before reentering.
- Wear appropriate levels of personal protective equipment (including hearing protection).
- No smoking, eating, or drinking inside the exclusion zone or contamination reduction zone.
- Unauthorized breeches of safety protocol are prohibited.
- Wear and use clean respirators as indicated and store according to protocol.
- Contact lenses are not to be worn by persons wearing respirators, sampling wells, or in any other situations where irritating gases may become trapped beneath the lense.

### **3.0 Sampling of Airborne Constituents**

- Air sampling shall be performed in all designated work areas for potentially hazardous airborne substances.
- Monitoring shall be accomplished via real-time direct reading methods (PID, FID OVA, CGI, O<sub>2</sub>, etc.); however, specific contaminant monitoring may be used to identify a specific compound if deemed necessary by the HSC.

- Initial trigger levels are listed on the attached Table A-1. Until potential contaminants are fully identified, no visible emissions represents the dust action level at the perimeter.
- Personal air sampling will be performed using organic vapor badges and/or other personal methods as directed by the SHSO.
- The ambient air around each activity location shall be sampled before, during, and after work. One and six foot levels above ground and at height of release shall be monitored. The area at various distances from the activities shall be scanned regularly (for instance, hourly) using a common sense approach based on readings found and on previously discovered constituents for each location.
- Instruments will be calibrated and used according to manufacturers' specifications. Readings from uncalibrated or improperly calibrated instruments will not give valid measurements.
- All sample and calibration data shall be recorded in a site-specific, bound log.
- All work is anticipated to be in Level D or Level C PPE.
- All work in the CRZ and exclusion zone shall be conducted in *saranex/polytyvek* suits, layered latex gloves and nitrile outer gloves, hard hat, safety glasses, and disposable booties.
- All personnel conducting work along the ditch and on the slopes of the ditch shall wear an approved safety harness.

**NOTE: Use a full-face air purifying respirator with a combination organic vapor/HEPA particulate filter cartridge whenever inhalation hazards or other compounds with extremely low TWAs are confirmed or suspected.**

**TABLE A-1**  
**HAZARD MONITORING METHODS, ACTION LEVELS AND PROTECTIVE MEASURES**

<b>Hazard</b>	<b>Monitoring Method</b>	<b>Action Level</b>	<b>Monitoring Schedule</b>	<b>Protective Measures</b>
Organic Vapors/Semi-Volatile Organic Vapors	HNU with 10.6 probe or greater eV probe (calibrated to Benzene)/FID (Photovac, Foxboro, etc.)	<p>Sustained reading above background in the site worker's breathing zone.</p> <p>&gt;5 ppm above background in the sustained reading site worker's breathing zone and</p> <p>After the implementation of engineering controls.</p>	<p>Continuing working and monitoring.</p> <p>Cease work and reassess site conditions; upgrade PPE.</p>	<p>Level C</p> <p>Level B</p>
Explosion	CGI	<p>0-10% LEL</p> <p>10-20% LEL</p> <p>≥ 20% LEL</p>	<p>Continue investigation.</p> <p>Continue monitoring with caution as higher levels are encountered. Revoke Hot Work Permit. Stop all "hot work" in progress.</p> <p>Explosion hazard – withdraw from area immediately, and contact SHSO, a reassessment of site conditions may be necessary.</p>	<p>Level of site PPE</p> <p>Evacuate Area</p>
Oxygen Deficiency	Oxygen Meter	<p>&lt;19.5%</p> <p>19.5%-23.5%</p> <p>&gt;23.5%</p>	<p>Cease all operations and leave work area; contact HSC or SHSO.</p> <p>Continue work; deviation from normal level may be due to the presence of other substances.</p> <p>Cease all operations and leave work area; contact HSC or SHSO; potential fire hazard may exist.</p>	<p>No Entry</p> <p>Continued Monitoring Level of PPE</p> <p>Evacuate Area</p>

#### **4.0 Points to Remember**

- The Contractor will maintain a 2-way radio and air horn must be on-site at all times.
- Hand Signals include:

Hands on throat -- I'm out of air.

Grip partners wrist or hands on hips -- Leave area immediately.

Thumbs up -- OK; I'm alright.

Thumbs down -- Negative; There is a problem.

- Emergency phone numbers and a map to the hospital are included as Attachment G to the HASP. A company vehicle should always be on-site.
- Report all injuries or illnesses, including all minor injuries, to the HSC or SHSO.

#### **5.0 Key Personnel**

Project Coordinator	Peter Goetz	office: (405) 447-8300 pager: (888) 732-8904 mobile: (405) 833-9009
Project Manager, Kerr-McGee, LLC	A. Keith Watson	office: (405) 270-3747
Project Manager, HAI	Scott Lockhart, P.E.	office: (419) 241-7171 pager: (419) 323-1396 mobile: (419) 262-9318
Health & Safety Coordinator	to be determined	
USEPA On-Scene Coordinator	Ralph Dollhopf	office: (313) 692-7682 pager: (800) 395-8903
USEPA Remedial Project Manager	Deborah Orr	office: (312) 886-7576

**ATTACHMENT B**

**Personnel Acknowledgement to Health and Safety Plan**

## PERSONNEL ACKNOWLEDGEMENT TO HEALTH AND SAFETY PLAN

I have read and fully understand this health and safety plan and agree to comply with its contents. I understand that employers have the ultimate responsibility for providing a safe and healthy work environment for its employees. By signing this page, I hereby represent that I have read and understand the contents of this plan and agree to perform my work in accordance with it.

**Site Name and Number** Toledo Tie Treatment Site

[illegible]

**ATTACHMENT C**

*Material Safety Data Sheets*

**Genium Publishing Corp.**

One Genium Plaza  
Schenectady, NY 12304-4690  
(518) 377-8854

**Material Safety Data Sheet Collection****Phenanthrene****MSDS No. 905**

Date of Preparation: 6/94

**Section 1 - Chemical Product and Company Identification****44****Product/Chemical Name:** Phenanthrene**Chemical Formula:** (C<sub>6</sub>H<sub>4</sub>CH)<sub>2</sub>**CAS No.:** 85-01-8**Synonyms:** Phenantrin**Derivation:** A polynuclear aromatic hydrocarbon found as a component of coal tar pitch volatiles (products of bituminous coal distillation). Produced from toluene, bibenzil, 9-methyl fluorene or stilbene by passage through red hot tubes or by diene synthesis of 1-vinyl naphthalene and maleic anhydride.**General Use:** Used in the manufacture of dyestuffs and explosives; in biological research or drug synthesis.**Vendors:** Consult the latest *Chemical Week Buyers' Guide*.<sup>(73)</sup>**Section 2 - Composition / Information on Ingredients**

Phenanthrene, ca 100 % wt

**OSHA PEL\***8-hr TWA: 0.2 mg/m<sup>3</sup>**NIOSH REL\***10-hr TWA: 0.1 mg/m<sup>3</sup>, *cyclohexane*  
*extractable fraction***DFG (Germany) MAK**

None established

**ACGIH TLV\***TWA: 0.2 mg/m<sup>3</sup>

\*Coal tar pitch volatiles (benzene soluble)

**Section 3 - Hazards Identification****☆☆☆☆☆ Emergency Overview ☆☆☆☆☆**

Phenanthrene exists as shiny crystals with a faint, aromatic odor. It can cause photosensitization of the skin.

Phenanthrene is combustible and reacts dangerously with oxidizers.

**Wilson  
Risk  
Scale**  
R 1  
I 3  
S 3  
K 1**Potential Health Effects****HMIS**  
H 1  
F 1  
R 0

Sec. 8

**Primary Entry Routes:** Skin contact.**Target Organs:** Skin.**Acute Effects****Inhalation:** Effects not reported.**Eye:** Effects not reported.**Skin:** Can cause photosensitization of the skin.**Ingestion:** Effects not reported.**Carcinogenicity:** Although it has produced skin cancer in experimental animals, the results were not statistically significant and IARC has assigned phenanthrene a Class 3 (unclassifiable as to carcinogenicity) designation. The NTP and OSHA do not list phenanthrene as a carcinogen.**Medical Conditions Aggravated by Long-Term Exposure:** Skin disorders.**Chronic Effects:** None reported.**Section 4 - First Aid Measures****Inhalation:** Remove exposed person to fresh air and support breathing as needed.**Eye Contact:** Do not allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.**Skin Contact:** Quickly remove contaminated clothing. Rinse exposed area with flooding amounts of water to remove loose material and then move quickly to a soap and water wash. For reddened or blistered skin, consult a physician.**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the conscious and alert person drink 1 to 2 glasses of water, then induce vomiting.**After first aid, get appropriate in-plant, paramedic, or community medical support.****Note to Physicians:** Treatment is symptomatic and supportive.

## Section 5 - Fire-Fighting Measures

**Flash Point:** 340 °F (171 °C)

**Flash Point Method:** OC

**LEL:** Not reported.

**UEL:** Not reported.

**Flammability Classification:** Class IIIB Combustible liquid

**Extinguishing Media:** Use dry chemical or carbon dioxide; water spray or foam may cause frothing.

**Unusual Fire or Explosion Hazards:** None reported

**Hazardous Combustion Products:** Carbon oxides (CO<sub>x</sub>) and acrid smoke

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways.

**Fire-Fighting Equipment:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.



## Section 6 - Accidental Release Measures

**Spill /Leak Procedures:** Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against skin contact.

**Small Spills:** To avoid dust generation, *do not sweep!* Carefully scoop up or vacuum (with appropriate filter). Damp mop residue.

**Large Spills**

**Containment:** Flush large spill to containment area for later disposal. Do not release into sewers or waterways.

**Cleanup:** Mop up any residue.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Use nonsparking tools to open containers.

**Storage Requirements:** Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from heat, ignition sources, and strong oxidizers.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** To prevent static sparks, electrically ground and bond all equipment used with and around phenanthrene.

**Ventilation:** Provide general or local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source. (103)

**Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. The following respirator recommendation is for *coal-tar pitch volatiles*: For any detectable concentration, use a SCBA or supplied-air respirator (with auxiliary SCBA) with a full facepiece and operated in pressure-demand or other positive pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

**Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.

**Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

## Section 9 - Physical and Chemical Properties

**Physical State:** Solid

**Appearance and Odor:** Colorless, shiny crystals with a faint, aromatic odor.

**Vapor Pressure:** 1 mm Hg at 244.76 °F (118.2 °C);

400 mm Hg at 586.4 (308 °C)

**Formula Weight:** 178.22

**Density (H<sub>2</sub>O=1, at 4 °C):** 1.179 g/L at 77 °F (25 °C)

**Water Solubility:** 1.6 mg/L at 59 °F (15 °C)

**Other Solubilities:** 1 g in: 2.4 mL toluene, 2.4 mL carbon tetrachloride, 2 mL benzene, 1 mL carbon disulfide, 25 mL absolute alcohol, 60 mL cold 95% alcohol, 10 mL boiling 95% alcohol and 3.3 mL anhydrous ether. Also soluble in glacial acetic acid, chloroform, and hot pyridine.

**Boiling Point:** 644 °F (340 °C)

**Melting Point:** 213 °F (101 °C)

**Refraction Index:** 1.59427

**Octanol/Water Partition Coefficient:** log Kow = 4.57

**Section 1 - Chemical Product and Company Identification****43****Product/Chemical Name:** Benzo(a)pyrene**Chemical Formula:**  $C_{20}H_{12}$ ; a polynuclear aromatic hydrocarbon**CAS No.:** 50-32-8**Synonyms:** BaP; 3,4-benz(a)pyrene; BP; 3,4-benzopyrene; 3,4-benzpyrene. Formerly called 1,2-benzpyrene.**Derivation:** Synthesized from pyrene and succinic anhydride.**General Use:** Benzo(a)pyrene is no longer used or produced commercially in the US. In its pure form, benzo(a)pyrene may be used as a research laboratory reagent. It also occurs in combustion products of coal, oil, petroleum, wood and other biological matter; in motor vehicle and other gasoline and diesel engine exhaust; in charcoal-broiled foods; in cigarette smoke and general soot and smoke of industrial, municipal, and domestic origin. It occurs naturally in crude oils, shale oils, coal tars, gases and fly ash from active volcanoes and forest fires. **Vendors:** Consult the latest *Chemical Week Buyers' Guide*. (73)**Section 2 - Composition / Information on Ingredients**

Benzo(a)pyrene, ca 100 %wt; except in laboratories, benzo(a)pyrene is usually mixed with other coal tar pitch chemicals. Consider exposure limits for coal tar pitch volatiles as a guideline. However, because benzo(a)pyrene is considered a probable carcinogen to humans, it is recommended that exposures to carcinogens be limited to the lowest feasible concentration.

**OSHA PELs**

Coal tar pitch volatiles

8-hr TWA: 0.2 mg/m<sup>3</sup>**ACGIH TLVs**

A2: Suspected Human Carcinogen

**NIOSH REL**10-hr TWA: 0.1 mg/m<sup>3</sup>Carcinogen; coal tar pitch volatile,  
cyclohexane extractable fraction.**DFG (Germany) MAK**

None established

**IDLH Level**700 mg/m<sup>3</sup>Coal tar pitch volatiles (benzene soluble  
fraction)**Section 3 - Hazards Identification****☆☆☆☆☆ Emergency Overview ☆☆☆☆☆**

Benzo(a)pyrene is a pale yellow, crystalline solid or powder that is irritating to the skin, eyes, and respiratory tract. It is a carcinogen and mutagen. Handle with extreme caution!

**Potential Health Effects****Primary Entry Routes:** Inhalation, ingestion. **Target Organs:** Respiratory system, bladder, kidneys, skin.**Acute Effects:** Inhalation: Respiratory tract irritation. Eye: Irritation and/or burns on contact. Skin: Irritation with burning sensation, rash, and redness; dermatitis on prolonged exposure. Sunlight enhances effects (photosensitization). Ingestion: None reported.**Carcinogenicity:** IARC, NTP, NIOSH, ACGIH, EPA, and MAK list benzo(a)pyrene as: an IARC 2A (probably carcinogenic to humans: limited human evidence, sufficient evidence in experimental animals), an NTP-2 (reasonably anticipated to be a carcinogen: limited evidence from studies in humans or sufficient evidence from studies in experimental animals), a NIOSH-X (carcinogen defined with no further categorization); an ACGIH TLV-A2 (suspected human carcinogen: carcinogenic in experimental animals, but available epidemiological studies are conflicting or insufficient to confirm an increased risk of cancer in exposed humans); an EPA-B2 (sufficient evidence from animal studies, inadequate evidence or no data from epidemiological studies); and an MAK-A1 (capable of inducing malignant tumors as shown by experience with humans) carcinogen, respectively.**Medical Conditions Aggravated by Long-Term Exposure:** Respiratory system, bladder, kidney, and skin disorders.**Chronic Effects:** Inhalation: Cough and bronchitis. Eye: Photosensitivity and irritation. Skin: Skin changes such as thickening, darkening, pimples, loss of color, reddish areas, thinning of the skin, and warts. Sunlight enhances effects (photosensitization).**Other:** Gastrointestinal (GI) effects include leukoplakia (a pre-cancerous condition characterized by thickened white patches of epithelium on mucous membranes, especially of the mouth). Cancer of the lung, skin, kidneys, bladder, or GI tract is also possible. Smoking in combination with exposure to benzo(a)pyrene increases the chances of developing lung cancer. Persons with a high degree of inducibility of the enzyme aryl hydrocarbon hydroxylase may be a high risk population.**Comments:** Pregnant women may be especially susceptible to exposure effects of benzo(a)pyrene; exposure may damage the fetus. In general, polyaromatic hydrocarbons such as benzo(a)pyrene tend to localize primarily in body fat and fatty tissues (for ex. breasts) and are excreted in breast milk. Benzo(a)pyrene may also affect the male reproductive system (testes and sperm).**Wilson  
Risk  
Scale**

R	1
I	4
S	4
K	1

**HMIS**

H	2*
F	1
R	0

\* Chronic  
Effects  
PPE†

†Sec. 8

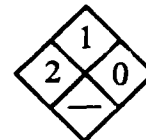
**Section 4 - First Aid Measures****Inhalation:** Remove exposed person to fresh air and support breathing as needed.

- Eye Contact:** Do not allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of tepid water for at least 15 min. Consult an ophthalmologist if irritation or pain persist.
- Skin Contact:** Quickly remove contaminated clothing. Rinse with flooding amounts of water (less than 15 min). Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.
- Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Inducing vomiting is not necessary since benzo(a)pyrene has a low acute toxicity and therefore, is generally an unnecessary procedure. Consider activated charcoal/cathartic.
- After first aid, get appropriate in-plant, paramedic, or community medical support.**
- Note to Physicians:** Monitor CBC and arterial blood gases, conduct liver, renal, and pulmonary function tests (if respiratory tract irritation is present), and urinalysis. Biological monitoring techniques testing for metabolites in blood or urine, or DNA adducts in blood or tissues are useful for epidemiological studies that determine if exposure has occurred. Because neither normal nor toxic levels have been established, those techniques may not be useful for evaluating individual patients.
- Special Precautions/Procedures:** Emergency personnel should protect against exposure.

## Section 5 - Fire-Fighting Measures

- Flash Point:** None reported. Benzo(a)pyrene may burn, but does *not* readily ignite.
- Autoignition Temperature:** None reported.
- LEL:** None reported.
- UEL:** None reported.
- Extinguishing Media:** For small fires, use dry chemical, sand, water spray, or foam. For large fires, use water spray, fog, or foam.
- Unusual Fire or Explosion Hazards:** None reported.
- Hazardous Combustion Products:** Carbon monoxide and carbon dioxide.
- Fire-Fighting Instructions:** Isolate hazard and deny entry. If feasible and without undue risk, move containers from fire hazard area. Otherwise, cool fire-exposed containers with water spray until well after fire is extinguished. Do not release runoff from fire control methods to sewers or waterways.
- Fire-Fighting Equipment:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode and full protective clothing.

Genium



## Section 6 - Accidental Release Measures

- Spill /Leak Procedures:** Notify safety personnel of large spills, remove heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against dust inhalation and skin or eye contact. Clean up spills promptly.
- Small Spills:** Carefully scoop up spilled material and place into appropriate containers for disposal. For liquid spills, take up with a noncombustible, inert absorbent and place into appropriate containers for disposal.
- Large Spills**
- Containment:** For large spills, dike far ahead of liquid spill or contain dry spill for later disposal. Do not release into sewers or waterways.
- Cleanup:** Do not dry sweep! Use a vacuum with a HEPA filter or a wet method to reduce dust. After cleanup is complete, thoroughly decontaminate all surfaces. Do not reuse contaminated cleaning materials.
- Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

- Handling Precautions:** Handle with extreme caution and take all necessary measures to avoid exposure to benzo(a)pyrene because it is a carcinogen and mutagen. Follow good personal hygiene procedures and thoroughly wash hands with soap and water after handling. Use safety pipettes for all pipetting.
- Storage Requirements:** Store in tightly closed and properly labeled containers in a cool, well-ventilated area.

## Section 8 - Exposure Controls / Personal Protection

- Engineering Controls:** Use a Class I, Type B, biological safety hood when working with benzo(a)pyrene in a laboratory. Decrease the rate of air extraction, so that benzo(a)pyrene can be handled without powder being blown around the hood. Keep glove boxes under negative pressure. Use vertical laminar-flow, 100% exhaust, biological safety cabinets for containment of in vitro procedures. The exhaust air flow should be sufficient to provide an inward air flow at the face opening of the cabinet. Ensure contaminated air sheaths that are under positive pressure are leak-tight. Never use horizontal laminar-flow hoods or safety cabinets where filtered air is blown across the working area towards the operator. Test cabinets before work begins to ensure they are functioning properly.
- Ventilation:** Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source. (103)
- Administrative Controls:** Consider preplacement and periodic medical examinations with emphasis on the oral cavity, bladder, kidneys, skin, and respiratory tract. Conduct urinalysis including specific gravity, albumin, glucose, and microscopic examination of centrifuged sediment for red blood cells. Also, include 14" x 17" chest roentgenogram, FVC + FEV<sub>1</sub>, and CBC to detect any leukemia or aplastic anemia. It is recommended that this exam be repeated on an annual basis and semi-

annual basis for employees 45 yr of age or older or with 10 or more years of exposure to coal tar pitch volatiles. Train workers about the hazards of benzo(a)pyrene and the necessary protective measures to prevent exposure. Periodically inspect lab atmospheres, surfaces such as walls, floors, and benches, and interior of fume hoods and air ducts for contamination. Post appropriate signs and labels on doors leading into areas where benzo(a)pyrene is used.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. The following respirator recommendations are for coal tar pitch volatiles. For any unknown concentration, wear any SCBA with a full facepiece and operated in a pressure-demand or other positive pressure mode, or any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive pressure mode. For escape, wear any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter, or any appropriate escape-type SCBA. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. In animal laboratories, wear protective suits (disposable, one-piece and close-fitting at ankles and wrists), gloves, hair covering, and overshoes. In chemical laboratories, wear gloves and gowns. Wear protective eyeglasses or chemical safety, gas-proof goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

**Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

**Contaminated Equipment:** Shower and change clothes after exposure or at the end of the workshift. Separate contaminated work clothes from street clothes. Launder before reuse. Remove benzo(a)pyrene from your shoes and clean personal protective equipment. Use procedures to ensure laundry personnel are not exposed.

**Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

## Section 9 - Physical and Chemical Properties

**Physical State:** Solid

**Appearance and Odor:** Pale yellow monoclinic needles with a faint, aromatic odor.

**Vapor Pressure:** >1 mm Hg at 68 °F (20 °C)

**Formula Weight:** 252.30

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 1.351

**Water Solubility:** Insoluble; 0.0038 mg (+/- 0.00031 mg) in 1 L at 77 °F (25 °C)

**Other Solubilities:** Ether, benzene, toluene, xylene, concentrated hydrosulfuric acid; sparingly soluble in alcohol, methanol.

**Boiling Point:** >680 °F (>360 °C); 540 °F (310 °C) at 10 mm Hg

**Melting Point:** 354 °F (179 °C)

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub>= 6.04

## Section 10 - Stability and Reactivity

**Stability:** Benzo(a)pyrene is stable at room temperature in closed containers under normal storage and handling conditions. It undergoes photo-oxidation when exposed to sunlight or light in organic solvents and is also oxidized by chromic acid and ozone.

**Polymerization:** Hazardous polymerization cannot occur.

**Chemical Incompatibilities:** Strong oxidizers (chlorine, bromine, fluorine) and oxidizing chemicals (chlorates, perchlorates, permanganates, and nitrates).

**Conditions to Avoid:** Avoid heat and ignition sources and incompatibles.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of benzo(a)pyrene can produce carbon monoxide and carbon dioxide.

## Section 11- Toxicological Information

### Toxicity Data: \*

#### Tumorigenic Effects:

Rat, oral: 15 mg/kg produced gastrointestinal and musculoskeletal tumors.

Mouse, inhalation: 200 ng/m<sup>3</sup>/6 hr administered intermittently over 13 weeks produced tumors of the lungs.

Rabbit, skin: 17 mg/kg administered intermittently over 57 weeks produced tumors of the skin and appendages.

#### Teratogenicity:

Rat, oral: 2 g/kg administered 28 days prior to mating and 1-22 days of pregnancy produced a stillbirth.

Rat, oral: 40 mg/kg on the 14th day of pregnancy caused changes in the extra embryonic structures.

Mouse, oral: 75 mg/kg administered to the female during the 12-14 day of pregnancy produced biochemical and metabolic effects on the newborn.

**Skin Effects:**

Mouse: 14 µg caused mild irritation.

**Mutagenicity:**

Human, liver cell: 100 nmol/L caused DNA damage.

Human, lung cell: 1 µmol/L caused DNA damage.

Human, HeLa cell: 1500 nmol/L caused DNA inhibition.

\* See NIOSH, RTECS (DJ3675000), for additional toxicity data.

**Section 12 - Ecological Information**

**Ecotoxicity:** Oysters, BCF (bioconcentration factor): 3000; rainbow trout, BCF: 920; *Daphnia pulex*, BCF: 13,000.

**Environmental Transport:** Some marine organisms such as phytoplankton, certain zooplankton, scallops (*Placopecten sp.*), snails (*Littornia littorea*), and mussels (*Mytilus edulis*) lack a metabolic detoxification enzyme system to metabolize benzo(a)pyrene and therefore, tend to accumulate benzo(a)pyrene. Humic acid in solution may decrease bioconcentration.

**Environmental Degradation:** If released to water, benzo(a)pyrene adsorbs very strongly to particulate matter and sediments, bioconcentrates in aquatic organisms which cannot metabolize it, but does not hydrolyze. Direct photolysis at the water surface, evaporation, or biodegradation may be important, but adsorption may significantly retard these processes. Adsorption to particulates may also retard direct photolysis when benzo(a)pyrene is released to air. Benzo(a)pyrene may be removed from air by reaction with nitrogen dioxide (half-life, 7 days) or ozone (half-life, 37 min), or photochemically produced hydroxyl radicals (estimated half-life, 21.49 hr).

**Soil Absorption/Mobility:** It will adsorb very strongly to the soil. Although it is not expected to appreciably leach to the groundwater, groundwater samples indicate that it can be transported there. It is not expected to significantly evaporate or hydrolyze from soils and surfaces. However, it may be subject to appreciable biodegradation in soils.

**Section 13 - Disposal Considerations**

**Disposal:** Small quantities: 10 mL of a solution containing 0.3 mol/L of potassium permanganate and 3 mol/L of sulfuric acid will degrade 5 mg of benzo(a)pyrene. Also, can treat with sodium dichromate in strong sulfuric acid (1-2 days). Benzo(a)pyrene is also a good candidate for fluidized bed incineration at a temperature range of 842 to 1796 °F (450 to 980 °C) or rotary kiln incineration at 820 to 1600°C. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**Section 14 - Transport Information****DOT Transportation Data (49 CFR 172.101):**

**Shipping Name:** Environmentally hazardous substances, solid, n.o.s.\*

**Shipping Symbols:** —

**Hazard Class:** 9

**ID No.:** UN3077

**Packing Group:** III

**Label:** Class 9

**Special Provisions (172.102):** 8, B54

**Packaging Authorizations**

a) Exceptions: 173.155

b) Non-bulk Packaging: 173.213

c) Bulk Packaging: 173.240

**Quantity Limitations**

a) Passenger, Aircraft, or Railcar: None

b) Cargo Aircraft Only: None

**Vessel Stowage Requirements**

a) Vessel Stowage: A

b) Other: —

\* If it is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) of 1 lb (0.454 kg)

**Section 15 - Regulatory Information****EPA Regulations:**

Listed as a RCRA Hazardous Waste (40 CFR 261.33)

RCRA Hazardous Waste Number: 11022

Listed as a CERCLA Hazardous Substance (40 CFR 302.4) per RCRA and CWA, Sec. 307(a)

CERCLA Reportable Quantity (RQ), 1 lb (0.454 kg)

SARA 311/312 Codes: 1,2

SARA Toxic Chemical (40 CFR 372.65): Not listed

SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed

**OSHA Regulations:**

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1)

Listed as an OSHA Specifically Regulated Substance, Coal Tar Pitch Volatiles, (29CFR 1910.1002)

**Section 16 - Other Information**

**References:** 73, 103, 124, 127, 132, 133, 136, 139, 148, 164, 169, 174, 175, 184, 187, 189, 190

**Prepared By ..** MJ Wurth, BS **Industrial Hygiene Review ....** PA Roy, MPH **Medical Review ....** T Thoburn, MD, MPH

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**Material Safety Data Sheets Collection:**

Sheet No. 711  
Pyrene

Issued: 4/90

**Section 1. Material Identification**

**Pyrene Description:** A condensed ring, polyaromatic hydrocarbon compound derived from coal tar. Also synthesized from o,o'-ditolyl. Used in biochemical research and as starting material for synthesizing benzo(a)pyrene. An ingredient of smoked and broiled meat, tobacco smoke, and air pollution.

**Other Designations:** CAS No. 0129-00-0; C<sub>16</sub>H<sub>10</sub>; beta-pyrene; benzo(d,e,f)phenanthrene; benzo(d,e,f)phenanthrene.

**Manufacturer:** Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*<sup>(7)</sup> for a suppliers list.

R	1	<b>Genium</b>  HMIS H 2 F 1 R 0 PPG† † Sec. 8
I	3	
S	2*	
K	-	
* Skin absorption		

**Section 2. Ingredients and Occupational Exposure Limits**

Pyrene, ca 100%

OSHA PEL

8-hr TWA: 0.2 mg/m<sup>3</sup>

ACGIH TLV, 1989-90

None established

NIOSH REL, 1987

None established

**Toxicity Data\***

Rat, oral, LD<sub>50</sub>: 2700 mg/kg ingested produces conjunctiva irritation, excitement, and muscle contraction

Rat, inhalation, LC<sub>50</sub>: 170 mg/m<sup>3</sup> inhaled produces conjunctiva irritation, excitement, and muscle contraction

Gene mutation in mammalian cells; human cell types: 12 µmol/l

\* See NIOSH, RTECS (UR2450000), for additional mutative, tumorigenic, and toxicity data.

**Section 3. Physical Data**

Boiling Point: 759 °F/404 °C

Melting Point: 313 °F/156 °C

Vapor Pressure: 6.85 x 10<sup>-7</sup> torr at 68 °F/20 °C

Molecular Weight: 202.26 g/mol

Specific Gravity (H<sub>2</sub>O = 1 at 39 °F/4 °C): 1.271 at 73 °F/23 °C

Water Solubility: Insoluble (0.135 mg/l)

**Appearance and Odor:** Colorless solid or a slight blue florescent solution. Tetracene impurities give pyrene a yellow color.

**Section 4. Fire and Explosion Data**

Flash Point: None reported

Autoignition Temperature: None reported

LEL: None reported

UEL: None reported

**Extinguishing Media:** Use foam, dry chemical, and CO<sub>2</sub> to extinguish fire.

**Unusual Fire or Explosion Hazards:** Pyrene is a flammable and combustible material that heat and ignition sources may ignite. It burns rapidly with a flare-like effect.

**Special Fire-fighting Procedures:** Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Avoid skin contact. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

**Section 5. Reactivity Data**

**Stability/Polymmerization:** Pyrene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

**Hazardous Products of Decomposition:** Thermal oxidative decomposition of pyrene can emit irritating fumes and acrid smoke.

**Section 6. Health Hazard Data**

**Carcinogenicity:** In 1990 reports, the IARC, NTP, and OSHA list coal tar creosote as a carcinogen.

**Summary of Risks:** Coal tar creosote is toxic by inhalation, ingestion, and skin contact. It contains a variety of hydrocarbons such as phenol and polycyclic aromatic hydrocarbons such as benzo[a]pyrene, benzanthracene, and phenol derivatives. The range of toxicity depends on the exposure concentration, amount, and duration. Effects may include irritation, burns, and several forms of cancer.

**Medical Conditions Aggravated by Long-Term Exposure:** Chronic respiratory or skin diseases.

**Target Organs:** Eyes, skin, bladder, kidneys, and respiratory system.

**Primary Entry Routes:** Inhalation, ingestion, and skin contact.

**Acute Effects:** Skin contact may cause irritation, burning, itching, redness, pigment changes, dermatitis (a rash of redness and small bumps), or burns. Photosensitization (worsening of rash with exposure to sunlight) may occur. Inhalation may be irritating to the respiratory tract. Eye contact may cause conjunctivitis (inflammation of the eye's lining), keratitis (corneal inflammation), or corneal burns with scarring. Ingestion may result in nausea, vomiting, abdominal pain, rapid pulse, respiratory distress, and shock. Systemic absorption by any route (including skin absorption) may cause trouble breathing, thready (continuous or drawn out) pulse, dizziness, headache, nausea, vomiting, salivation, and convulsions. Exposure to large doses (particularly by ingestion) may be fatal.

**Chronic Effects:** Dermatitis, skin cancer, and lung cancer.

**FIRST AID**

**Eyes:** Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Do not let victim rub eyes or keep them tightly closed. Consult a physician immediately.

**Skin:** Quickly remove contaminated clothing. Wash affected area with soap and flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician.

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. If ingested, have that conscious person drink 1 to 2 glasses of milk or water. Do not induce vomiting!

After first aid, get appropriate in-plant, paramedic, or community medical support.

**Note to Physicians:** Cresol may be detected in urine.

**Section 7. Spill, Leak, and Disposal Procedures**

**Spill/Leak:** Notify safety personnel. Isolate hazard area, deny entry, and stay upwind of spills. Shut off all ignition sources—no flares, smoking, or flames in hazard area. Cleanup personnel should protect against vapor inhalation and skin or eye contact. If possible with no risk, stop leak. Water spray may be used to reduce vapor but it may not prevent ignition in closed spaces. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for later disposal. For large spills, hike far ahead of liquid spill for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).

**Environmental Degradation:** Coal tar creosote is fouling to shoreline. Ecotoxicity values are: TL<sub>50</sub> goldfish (*Carassius auratus*), 3.51 ppm/24 hr (60:40) mixture of creosote and coal tar; LD<sub>50</sub> bob white quail (*Colinus virginianus*), 1,260 ppm/8 days (60:40) mixture of creosote and coal tar.

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**RCRA Designations**

Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Material No. U051

Listed as a CERCLA Hazardous Substance\* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.454 kg) [\* per RCRA, Sec. 3001]

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

Listed as a SARA Toxic Chemical (40 CFR 372.65)

**SHA Designations**

Listed (as coal tar pitch volatiles) as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

**Section 8. Special Protection Data**

**Goggles:** Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.

**Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.**

**Gloves:** Wear impervious gloves, boots, aprons, and gauntlets to prevent all skin contact. Applying a layer of petroleum jelly or lanolin castor oil to the face reduces vapor contact and penetration through skin. Frequent change of protective garments is an additional protective measure.

**Ventilation:** Provide general and local exhaust ventilation systems equipped with high-efficiency particulate filters to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.<sup>(109)</sup>

**Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

**Contaminated Equipment:** Take particular care to avoid any contamination of drains or ventilation ducts. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

**Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Section 9. Special Precautions and Comments**

**Storage Requirements:** Avoid physical damage to containers. Store in a cool, dry, well-ventilated area. Store coal tar creosote as close to area of use as possible to minimize transporting distance.

**Engineering Controls:** Use engineering controls to keep airborne concentrations below the OSHA PEL. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Always perform synthesis and purification procedures under a vertical ventilation hood and make regular operational safety checks. Label doors to rooms where coal tar creosote is produced, used, or stored as containing a carcinogen. Locate emergency equipment at well-marked and clearly identified stations in case emergency escape is necessary.

**Other Precautions:** Preplacement and periodic medical examinations of exposed workers emphasizing respiratory, skin, liver, and kidney disorders, including comprehensive work and medical history, physical examination, CXR, PFTs, urinalysis, LFT, and sputum cytology as the attending physician considers appropriate. Educate workers about coal tar creosote's carcinogenicity and proper handling procedures to avoid exposure.

**Other Comments:** Caution is in order when handling or sawing old creosote-treated lumber since it retains a considerable portion of creosote for up to 25 to 30 years.

**Transportation Data (49 CFR 172.101)**

DOT Shipping Name: Creosote

DOT Hazard Class: Flammable liquid

ID No.: UN1136

DOT Label: Flammable liquid

**DS Collection References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 139, 140, 142, 143, 146, 148, 153, 159

Prepared by: M Gannon, BA; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: Mark Upfal, MD, MPH; Edited by: JR Stuart, MS

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\* M S D S \*  
\* \*  
\* Canadian Centre for Occupational Health and Safety \*  
\* \* \* \* \* Issue : 98-1 (February, 1998) \*

\*\*\* IDENTIFICATION \*\*\*

MSDS RECORD NUMBER : 1581214  
PRODUCT NAME(S) : GREEN LIQ HAND SOAP  
DATE OF MSDS : 1996-11

\*\*\* MANUFACTURER INFORMATION \*\*\*

MANUFACTURER : Flexo Products Limited  
ADDRESS : 4777 Kent Avenue  
Niagara Falls Ontario  
Canada L2H 1J5  
Telephone: 905-354-2723  
Fax: 905-354-1301  
EMERGENCY TELEPHONE NO. : 613-996-6666 (CANUTEC)

\*\*\*

Message from Flexo Products: Information for this material safety data sheet was obtained from sources considered technically accurate and reliable. While every effort has been made to ensure full disclosure of product hazards, in some cases data is not available and is so stated. Since conditions of actual product use are beyond the control of the supplier, it is assumed that user of the material has been fully trained according to the mandatory requirements of WHMIS. No warranty, expressed or implied, is made and the supplier will not be liable for any losses, injuries or consequential damages which may result from the use of or reliance on any information contained in this form. If the user requires independent information on ingredients in this or any other material, we recommend contact with the Canadian Centre for Occupational Health and Safety (CCOHS) in Hamilton, Ontario (1-800-263-8466), or CSST in Montreal, Quebec (514-873-3990).

\*\*\* SUPPLIER/DISTRIBUTOR INFORMATION \*\*\*

SUPPLIER/DISTRIBUTOR : Flexo Products Limited  
ADDRESS : 4777 Kent Avenue  
Niagara Falls Ontario  
Canada L2H 1J5  
Telephone: 905-354-2723  
Fax: 905-354-1301  
EMERGENCY TELEPHONE NO. : 613-996-6666 (CANUTEC)

\*\*\* MATERIAL SAFETY DATA \*\*\*

MATERIAL SAFETY DATA SHEET

GREEN LIQ HAND SOAP

HMIS RATING	
Flammability	[0]
Health	[0]
Reactivity	[0]
Personal Protection	[0]

SECTION I - MATERIAL IDENTIFICATION AND USE

Material Name Identifier: GREEN LIQ HAND SOAP  
Material Use: Personal Care  
WHMIS Classification: Not Applicable

## SECTION II - HAZARDOUS INGREDIENTS

Ingredient	Wt. %	CAS #	TLV
LD50:			
LC50:			

Not Applicable by WHMIS Criteria

## SECTION III - PHYSICAL DATA

Physical State: Liquid  
Specific Gravity: 1.035  
Colour: Green  
Viscosity: 4.5 cps  
% Volatile: 84.5  
pH: 10.1  
Clarity: Clear  
Odour: Mild  
Vapour Density (Air=1): Similar  
Solubility in Water (20 deg C): Soluble  
Evaporation Rate (Water=1): Similar  
Boiling Point (deg C): 98

## SECTION IV - FIRE AND EXPLOSION DATA

Flammability: Not Applicable  
Flash Point (deg C TCC): Not Applicable  
LEL (% vol) lowest value of components: Not Appl.  
UEL (% vol) highest value of components: Not Appl.  
Hazardous Combustion Products: Not Applicable  
Means of Extinction: Treat for surrounding material.  
Special Fire Hazards: None known to us at this time.

## SECTION V - REACTIVITY DATA

Conditions For Chemical Instability: Stable  
Incompatibility: Strong acids.  
Hazardous Decomposition Products: Not Applicable

## SECTION VI - TOXICOLOGICAL PROPERTIES

Route of Entry: Eye. Skin Contact. Ingestion.  
Effects of Acute Exposure: Eye - May cause mild to moderate irritation.  
Ingestion - May cause vomiting, headache and medical problems.  
Effects of Chronic Exposure: Skin - Prolonged or repeated contact with concentrate may cause drying, defatting and dermatitis.  
Irritancy: Non-Hazardous by WHMIS Criteria  
Respiratory Tract Sensitization: No Data  
Carcinogenicity: Non-Hazardous by WHMIS  
Reproductive Effects: Insufficient Data  
Teratogenicity: Insufficient Data  
Mutagenicity: Insufficient Data  
Synergistic Materials: Not Avail.

## SECTION VII - PREVENTATIVE MEASURES

Gloves: Not normally required.  
Eye Protection: Not normally required.  
Respiratory Protection: Not normally required if good ventilation is maintained and exposure guidelines are not exceeded.  
Other Protective Equipment: As required by employer code.  
Engineering Controls: General ventilation is normally adequate.  
Leak and Spill Procedure: Small spills may be absorbed with non-reactive absorbent and placed in suitable, covered, labeled containers.  
Prevent large spills from entering sewers or waterways. Contact emergency services & supplier.  
Waste Disposal: Review Federal, Provincial and local government requirements

prior to disposal.

Storage Requirements: Store in closed container away from incompatible materials.

SECTION VIII - FIRST AID

Eye: Immediately flush with water for 15 minutes. If irritation persists, get medical attention.

Skin: Flush with water. Call a physician if irritation develops.

Discontinue use of product if irritation develops.

Inhalation: If inhaled, remove to fresh air. If symptoms persist, call a physician.

Ingestion: Do not induce vomiting. Rinse mouth with water, then drink one glass of water. Contact a physician immediately. Never give anything by mouth if victim is unconscious, is rapidly losing consciousness or is convulsing.

SECTION IX - ADDITIONAL INFORMATION

This material safety data sheet applies to the concentrated product. Diluted versions of this product may have different hazard ratings.

T.D.G. Shipping Name: Not Regulated under TDG

P.I.N.: Not Applicable

Class: Not Applicable

Prepared by: Flexo Products Limited

Date: November 1996

Aussi disponible en francais

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\* Canadian Centre for Occupational Health and Safety \*  
\* \* \* \* \* Issue : 98-1 (February, 1998) \*

\*\*\* IDENTIFICATION \*\*\*

MSDS RECORD NUMBER : 1554474  
PRODUCT NAME(S) : NITRIC ACID  
DATE OF MSDS : 1996-01-25

\*\*\* MANUFACTURER INFORMATION \*\*\*

MANUFACTURER : Diversy Water Technologies Ltd  
Subsidiary of NALCO  
ADDRESS : 110 Second Street  
Cobourg Ontario  
Canada K9A 3N5  
Fax: 905-372-2561  
EMERGENCY TELEPHONE NO. : 905-372-3344  
613-996-6666 (CANUTEC, 24 Hr)

\*\*\*

MESSAGE FROM DIVERSEY WATER TECHNOLOGIES LTD: Diversy Water Technologies Ltd.  
(DWT) assumes no responsibility for injury to any person or property resulting  
from normal use of this material if reasonable safety procedures are not  
adhered to. In addition DWT assumes no responsibility for injury to any person  
or property resulting from abnormal use or theft of this material even if  
reasonable safety procedures are followed.

\*\*\* MATERIAL SAFETY DATA \*\*\*

MATERIAL SAFETY DATA SHEET

HEALTH [ ] NFPA HAZARD SIGNAL  
STABILITY [ ] FLAMMABILITY [ ]  
SPECIAL [ ]

PRODUCT INFORMATION

PRODUCT NAME: NITRIC ACID  
WHMIS Class: D2B - TOXIC E - CORROSIVE  
Product Use: WATER TREATMENT

HAZARDOUS INGREDIENTS

INGREDIENTS	%	CAS#	PIN
NITRIC ACID	60-100	7697-37-2	2031
LD50/LC50	LDLo 430 mg/kg		
ROUTE/SPECIES**	O/H		

Note: All the components of this product are listed on the DOMESTIC SUBSTANCE  
LIST.

PHYSICAL DATA

Physical State: LIQUID  
Appearance and Odour: Colourless to yellow / strong  
Solubility in Water: Miscible  
Coefficient of water-oil distribution: NDA  
Boiling Point deg C: 120.0

Odour Threshold: NDA  
Specific Gravity: 1.38  
pH: .5  
Freezing/Melting Point deg C: NDA  
Evaporation Rate (but. acet.=1): NDA  
Vapour Pressure (mm Hg.): NDA  
Vapour Density (air=1): NDA

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#### FIRE OR EXPLOSION HAZARD DATA

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Conditions of flammability: N.Ap.  
Means of extinction: water  
Hazardous combustion products: NDA  
Flash point deg C and method: Not Flammable  
Auto-ignition temperature (deg C): NDA  
Explosion limits Upper: NDA Lower: NDA  
Explosion Data Mechanical Impact: NDA Static Discharge: NDA

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#### FIRST AID MEASURES

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Never give fluids or induce vomiting if patient is unconscious or having convulsions. If ingested call a physician.

Eyes: Immediately flush with water for 15-30 minutes holding eyelids open.  
Skin: Wash well with lukewarm water and soap for at least 15 minutes. Immediately remove contaminated clothing and launder before reuse.  
Ingestion: Call a physician.  
Do not induce vomiting.  
Drink large quantities of milk or water (24-32 ounces).  
Inhalation: Remove to fresh air.  
If breathing is difficult give oxygen.

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#### REACTIVITY DATA

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Instability: stable under normal temperature and pressure  
Incompatibility (mat. to avoid): NDA  
Reactivity: NDA  
Hazardous decomposition products: nitrogen oxides

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#### PREVENTIVE MEASURES

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##### PERSONAL PROTECTIVE EQUIPMENT

Gloves (specify): Impervious Eyes (specify): Safety Goggles  
Footwear (specify): Impervious Clothing (specify): Impervious Apron  
Respirator (specify): NIOSH Approved Air Purifying Dust Mask if TLV exceeded  
Other: Pants

Engineering Controls: Local exhaust ventilation at point of or mist.

Leak and Spill Procedure: Wear protective clothing.  
Remove contaminated clothing and launder before re-use. Wash affected skin.

Waste disposal: Disposal must be made in accordance with local, provincial and federal regulations.

Handling Procedures and Equipment: For industrial use only.  
Avoid breathing vapours. Avoid generating vapours.  
Avoid contact with skin, eyes or clothing.  
Wash after handling or before eating.  
To dilute, always add acid to water to avoid splattering.

Storage Requirements: Store in cool dry place. Keep container closed when not in use.  
Keep from freezing.  
Keep in well ventilated area.

Special Shipping Information: Nitric Acid  
Class 8 (9.2) PIN 2031 PG II

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#### TOXICOLOGICAL PROPERTIES

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##### ROUTE OF ENTRY

Skin Contact: YES Skin Absorption: NDA Eye Contact: YES  
Ingestion: YES Inhalation: YES  
Effects of Acute Exposure: high irritant  
Effects of Chronic Exposure: irritant  
Teratogenicity: NDA Mutagenicity: NDA  
Irritancy of Product: Eye, skin and respiratory tract.  
Reproductive Toxicity: NDA Synergistic Products: NDA  
Sensitizing Capability: N.Ap.

Carcinogenicity: N.Ap. (ACGIH 1994-95)

##### Exposure Limit:

NITRIC ACID TLV-TWA 2 ppm 5.2 mg/cu.m (ACGIH 1994-95)

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#### PREPARATION INFORMATION

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Prepared by: Diversey Water Technologies Ltd., Laboratories, (905)372-3344  
Date: January 25, 1996 supersedes January 25, 1996 (N9266)

FORM TEC/030 NDA=No Data Available N.Ap.=Not Applicable NE=Not Established

\*\*O-ORAL I-INTRAVENUS P-PARENTERAL R-RAT M-MOUSE B-RABBIT H-HUMAN

G-GUINEA PIG

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\* Canadian Centre for Occupational Health and Safety \*  
\* \* \* \* \* Issue : 98-1 (February, 1998) \*

\*\*\* IDENTIFICATION \*\*\*

MSDS RECORD NUMBER : 1559155  
PRODUCT NAME(S) : **SULFURIC ACID**  
PRODUCT IDENTIFICATION : PRODUCT CODE R00000008700  
DATE OF MSDS : 1997-05-30

\*\*\* MANUFACTURER INFORMATION \*\*\*

MANUFACTURER : SUN COMPANY, INC  
ADDRESS : Ten Penn Center  
1801 Market Street  
Philadelphia Pennsylvania  
U.S.A. 19103-1699  
Telephone: 215-977-6182 (Joanne Houck)  
EMERGENCY TELEPHONE NO. : 800-964-8861 (SUN COMPANY, AFTER NORMAL BUSINESS HOURS)  
800-424-9300 (CHEMTREC, AFTER NORMAL BUSINESS HOURS)

\*\*\* MATERIAL SAFETY DATA \*\*\*

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

REVISION DATE: 05/30/1997  
UN NUMBER- UN1830

PRIMARY APPLICATION- INDUSTRIAL/LABORATORY

MANUFACTURER- SUN COMPANY, INC.  
TEN PENN CENTER  
1801 MARKET STREET  
PHILADELPHIA PA 19103-1699

SYNONYMS..... : OIL OF VITRIOL; DIPPING ACID; HYDROGEN SULFATE; BA  
CAS REGISTRY NO: 7664-93-9  
CAS NAME..... : **SULFURIC ACID**  
CHEMICAL FAMILY: MINERAL ACID  
INFORMATION  
SUPPLIER.. MARIA DAYRIT  
PHONE.... : (610) 859-1120

EMERGENCY PHONE NUMBERS (AFTER NORMAL BUSINESS HOURS)  
SUN CO.. 1-800-964-8861  
CHEMTREC. 1-800-424-9300

2. COMPOSITION / INFORMATION ON INGREDIENTS

EXPOSURE GUIDELINES

COMPONENT/CAS NO.	LO%	HI%	OSHA		ACGIH		SUN/MFR		UNIT
			TWA	STEL	TWA	STEL	TWA	STEL	
LIMITS FOR THE PRODUCT:									
			1		1		3		MG/M3

WATER  
7732-18-5 .50 7.00 NO SPECIFIC LIMIT

ADDITIONAL EXPOSURE LIMITS ----- GOVERNMENT REGULATION  
8 HR. TIME WEIGHTED PERMISSIBLE EXPOSURE- 3 PPM 1 MG/M3  
CEILING LIMIT ..... - 3 PPM 1 MG/M3

## =====

## 3. HAZARDS IDENTIFICATION

## EMERGENCY OVERVIEW -----

DANGER] HARMFUL IF INHALED. CAUSES RESPIRATORY TRACT IRRITATION. HARMFUL IF ABSORBED THROUGH SKIN. CORROSIVE TO SKIN AND EYES MAY CAUSE PERMANENT EYE INJURY. HARMFUL OR FATAL IF SWALLOWED. PULMONARY ASPIRATION HAZARD-CAN ENTER LUNGS AND CAUSE DAMAGE.

APPEARANCE-- CLEAR OILY LIQUID            ODOR-- SLIGHTLY PUNGENT

## POTENTIAL HEALTH EFFECTS -----

PRIMARY ROUTES OF ENTRY- INHALATION( X ) SKIN( X ) EYE( X ) INGESTION( X )

## INHALATION -----

EXCESSIVE EXPOSURES MAY CAUSE IRRITATION TO EYES, NOSE, THROAT, LUNGS; RESPIRATORY TRACT;

## SKIN -----

CORROSIVE] CAUSES IRREVERSIBLE TISSUE DAMAGE. SEVERE IRRITATION WITH PROLONGED OR REPEATED CONTACT. REMOVES NATURAL OILS & FATS FROM SKIN.

## EYE -----

CONTACT WITH THE EYE MAY CAUSE SEVERE IRRITATION. IRREVERSIBLE TISSUE DAMAGE--CORROSIVE]

## INGESTION -----

HARMFUL OR FATAL IF SWALLOWED. INGESTION OF THIS MATERIAL MAY CAUSE CORROSIVE BURNS TO MOUTH, THROAT AND GASTRO-INTESTINAL TRACT; PULMONARY ASPIRATION HAZARD IF SWALLOWED AND/OR VOMITING OCCURS - CAN ENTER LUNGS AND CAUSE DAMAGE.

CARCINOGEN LISTED BY-IARC(NO)    NTP(NO)    OSHA(NO)    ACGIH(NO)    OTHER(NO)

PRE-EXISTING MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE-  
NONE KNOWN OR REPORTED.

## =====

## 4. FIRST AID MEASURES

## INHALATION -----

MOVE PERSON TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION, OBTAIN MEDICAL ASSISTANCE.

## SKIN -----

IMMEDIATELY WASH WITH WATER FOR AT LEAST 15 MIN. OBTAIN MEDICAL ATTENTION. IMMEDIATELY REMOVE SOAKED CLOTHING. WASH CLOTHING BEFORE REUSE. DESTROY CONTAMINATED SHOES.

## EYE -----

FLUSH WITH WATER FOR AT LEAST 15 MINUTES. OBTAIN MEDICAL ASSISTANCE.

## INGESTION -----

DO NOT INDUCE VOMITING] GIVE LIQUIDS/DEMULCENTS. OBTAIN EMERGENCY MEDICAL ATTENTION. SMALL AMOUNTS WHICH ACCIDENTALLY ENTER MOUTH SHOULD BE RINSED OUT UNTIL TASTE OF IT IS GONE.

## =====

## 5. FIRE FIGHTING MEASURES

FLASH POINT: NON FLAMMABLE (DEG. F); NON FLAMMABLE (DEG. C)  
AUTOIGNITION TEMP.: NOT APPLICABLE (DEG. F); NOT APPLICABLE (DEG. C)

---FLAMMABLE LIMITS IN AIR---

LOWER EXPLOSIVE LIMIT (LEL): NOT APPLICABLE % VOLUME

UPPER EXPLOSIVE LIMIT (UEL): NOT APPLICABLE % VOLUME

FIRE AND EXPLOSION HAZARDS -----  
OXIDIZER (CONTACT MAY IGNITE COMBUSTIBLES) .

EXTINGUISHING-MEDIA -----  
NONE REQUIRED.

SPECIAL FIRE FIGHTING INSTRUCTIONS -----  
DO NOT USE WATER. WEAR SELF-CONTAINED BREATHING APPARATUS. WEAR  
STRUCTURAL FIREFIGHTERS PROTECTIVE CLOTHING.

NFPA/HMIS CLASSIFICATION	HAZARD RATING
HEALTH - 3 / 3	0=LEAST      1=SLIGHT
FIRE - 0 / 0	2=MODERATE    3=HIGH
REACTIVITY - 2 / 2	4=EXTREME
PERSONAL PROTECTION INDEX - X	

SPECIFIC HAZARD: WATER REACTIVE (NFPA)

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## 6. ACCIDENTAL RELEASE MEASURES

CONTAIN SPILL. USE PERSONAL PROTECTIVE EQUIPMENT STATED IN SECTION 8.  
ADVISE EPA; STATE AGENCY IF REQUIRED. NEUTRALIZE WITH AN APPROPRIATE  
AGENT. ABSORB ON INERT MATERIAL. SHOVEL, SWEEP OR VACUUM SPILL.

=====

## 7. HANDLING AND STORAGE

KEEP IN DRY CONTAINER. KEEP IN COOL, DRY PLACE. KEEP CONTAINER TIGHTLY  
CLOSED. KEEP IN WELL VENTILATED SPACE. AVOID CONTACT WITH THIS MATERIAL.  
WASH THOROUGHLY AFTER HANDLING.

=====

## 8. EXPOSURE CONTROL / PERSONAL PROTECTION

CONSULT WITH A HEALTH/SAFETY PROFESSIONAL FOR SPECIFIC SELECTION.

### VENTILATION -----

USE ONLY WITH ADEQUATE VENTILATION. VENTILATE AS NEEDED TO COMPLY WITH  
EXPOSURE LIMIT. GENERAL DILUTION VENTILATION ACCEPTABLE.

### PERSONAL PROTECTIVE EQUIPMENT -----

#### EYE -----

FULL FACE SHIELD RECOMMENDED TO PROTECT AGAINST SPLASH OF PRODUCT.  
CORROSIVE] SAFETY SHOWER AND EYEWASH NEEDED NEARBY.

#### GLOVES -----

PROTECTIVE GLOVES RECOMMENDED TO PROTECT AGAINST CONTACT WITH PRODUCT.

#### RESPIRATOR -----

CONCENTRATION-IN-AIR DETERMINES PROTECTION NEEDED. USE ONLY NIOSH  
CERTIFIED RESPIRATORY PROTECTION. HALF-MASK AIR PURIFYING RESPIRATOR  
WITH ACID GAS CARTRIDGES IS ACCEPTABLE TO 10 TIMES THE EXPOSURE LIMIT  
UNLESS EYE IRRITATION LEVELS ARE EXCEEDED AND NOT TO EXCEED THE  
CARTRIDGE LIMIT. FULL-FACE AIR PURIFYING RESPIRATOR WITH ACID GAS  
CARTRIDGES IS ACCEPTABLE TO 50 TIMES THE EXPOSURE LIMIT NOT TO EXCEED  
THE CARTRIDGE LIMIT. PROTECTION BY AIR PURIFYING RESPIRATORS IS LIMITED.  
USE A POSITIVE PRESSURE-DEMAND FULL-FACE SUPPLIED AIR RESPIRATOR OR SCBA  
FOR EXPOSURES ABOVE 50X THE EXPOSURE LIMIT. IF EXPOSURE IS ABOVE  
IDLH (IMMEDIATELY DANGEROUS TO LIFE & HEALTH) OR THERE IS THE POSSIBILITY  
OF AN UNCONTROLLED RELEASE OR EXPOSURE LEVELS ARE UNKNOWN THEN USE A  
POSITIVE PRESSURE-DEMAND FULL-FACE SUPPLIED AIR RESPIRATOR WITH ESCAPE  
BOTTLE OR SCBA.

#### OTHER -----

AVOID ALL SKIN CONTACT. FULL BODY PROTECTION REQUIRED IF CONTACT IS

POSSIBLE. CORROSIVE] SAFETY SHOWER AND EYE WASH REQUIRED NEARBY. LAUNDER SOILED CLOTHES.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT..... : 640 (DEG. F) \_\_\_\_\_ 338 (DEG. C)  
MELTING POINT..... : MINUS 28 (DEG. F) \_\_\_\_\_ MINUS 2 (DEG. C)  
SPECIFIC GRAVITY... : 1.84 (WATER=1)  
PACKING DENSITY.... : N/A (KG/M3)  
VAPOR PRESSURE..... : < 1.0 (MM HG @ 20 DEG C)  
VAPOR DENSITY..... : 3.40 (AIR=1)  
SOLUBILITY IN WATER.: 100 (% BY VOLUME)  
PH INFORMATION..... : 1.0 AT CONC. .1 G/L H2O  
% VOLATILES BY VOL.: N.D.  
EVAPORATION RATE... : < 1 (ETHYL ETHER=1)  
OCTANOL/WATER COEFF.: N.D.  
APPEARANCE..... : CLEAR OILY LIQUID  
ODOR..... : SLIGHTLY PUNGENT  
ODOR THRESHOLD..... : N.D. (PPM)  
VISCOSITY..... : N.D. SUS @ N.D DEG F ... N.D. CST @ N.D DEG C  
MOLECULAR WEIGHT... : N.D. (G/MOLE)

## 10. STABILITY AND REACTIVITY

STABILITY -----  
STABLE.  
CONDITIONS TO AVOID-  
MOISTURE, HEAT  
INCOMPATIBLE MATERIALS -----  
BASES AND ORGANIC MATERIALS  
HAZARDOUS DECOMPOSITION -----  
OXIDES OF SULFUR, HYDROGEN GAS  
POLYMERIZATION -----  
WILL NOT OCCUR.

## 11. TOXICOLOGICAL INFORMATION

### FOR THE PRODUCT -----

INHALATION: TOXIC] OVEREXPOSURE TO MIST OR VAPOR MAY CAUSE EYE, NOSE, THROAT, AND RESPIRATORY TRACT IRRITATION, COUGH, PHLEGM, SHORTNESS OF BREATH, WHEEZING, DENTAL EROSION, BURNS TO FACE AND BODY WHICH CAN RESULT IN MARKED SCARRING, BRONCHITIS, EMPHYSEMA. SKIN: SEVERE IRRITANT. PROLONGED OR REPEATED CONTACT MAY CAUSE DERMATITIS OR PERMANENT DAMAGE. EYE: CONTACT MAY CAUSE SEVERE IRRITATION, CORNEAL INJURY OR BLINDNESS. ORAL: HARMFUL OR FATAL IF SWALLOWED. MAY CAUSE BURNS TO MOUTH AND ESOPHAGUS, GASTROINTESTINAL TRACT. OCCUPATIONAL EXPOSURES TO STRONG INORGANIC MISTS CONTAINING SULFURIC ACID IS CLASSIFIED AS CARCINOGENIC TO HUMANS (IARC GROUP 1).

### WATER (COMPONENT)

INHALATION: NON-TOXIC UNDER USUAL CIRCUMSTANCES. ENTRY OF WATER INTO THE LUNGS EXCLUDES OXYGEN AND ACTS AS AN ASPHYXIAN, AND CAN CAUSE DEATH (DROWNING). SKIN: MINIMAL IRRITATION WITH PROLONGED OR REPEATED CONTACT. WHEN HEATED, MAY CAUSE THERMAL BURNS TO SKIN AND EYE. ORAL: NON-TOXIC.

## 12. ECOLOGICAL INFORMATION

### AQUATIC TOXICITY -----

24.5 PPM/24 HR./BLUEGILL/LETHAL/FRESH WATER 42.5 PPM/48 HR./PRAWN/LC50/

SALT WATER

=====

13. DISPOSAL CONSIDERATIONS

FOLLOW FEDERAL, STATE AND LOCAL REGULATIONS. RCRA HAZARDOUS WASTE. DO NOT FLUSH TO DRAIN/ STORM SEWER. CONTRACT TO AUTHORIZED DISPOSAL SERVICE.

=====

14. TRANSPORTATION INFORMATION

DOT-

PROPER SHIPPING NAME- **SULFURIC ACID**  
HAZARD CLASS- 8 (CORROSIVE MATERIAL)  
IDENTIFICATION NUMBER- UN1830  
LABEL REQUIRED- CORROSIVE MATERIAL

IMDG- PROPER SHIPPING NAME- NOT AVAILABLE

IATA- PROPER SHIPPING NAME- NOT AVAILABLE

=====

15. REGULATORY INFORMATION

SARA 302 THRESHOLD PLANNING QUANTITY. 1000 POUNDS

SARA 304 REPORTABLE QUANTITY ..... 1000 POUNDS

SARA 311 CATEGORIES- IMMEDIATE (ACUTE) HEALTH EFFECTS.. Y  
                          DELAYED (CHRONIC) HEALTH EFFECTS.. N  
                          FIRE HAZARD ..... Y  
                          SUDDEN RELEASE OF PRESSURE HAZARD. N  
                          REACTIVITY HAZARD ..... N

WHEN A PRODUCT AND/OR COMPONENT IS LISTED BELOW, THE REGULATORY LIST ON WHICH IT APPEARS IS INDICATED.

FOR THE PRODUCT - CT LA MA NJ OH PA RI WV 01 02 07

01=SARA 313	02=SARA 302/304	03=IARC CARCINOGEN
04=OSHA CARCINOGEN	05=ACGIH CARCINOGEN	06=NTP CARCINOGEN
07=CERCLA 302.4	08=WHMIS CONTROLLED PROD.	
10=OTHER CARCINOGEN		
PA=PENNSYLVANIA RTK	NJ=NEW JERSEY RTK	CA=CALIFORNIA PROP 65
MA=MASSACHUSETTS RTK	MI=MICHIGAN 406	MN=MINNESOTA RTK
FL=FLORIDA	RI=RHODE ISLAND	IL=ILLINOIS
NY=NEW YORK	WV=WEST VIRGINIA	CT=CONNECTICUT
LA=LOUISIANA	ME=MAINE	OH=OHIO

THIS PRODUCT OR ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE U.S. TSCA INVENTORY.

=====

16. OTHER INFORMATION

NONE

\* \* \* \* \*  
\* M S D S \*  
\* \*  
\* Canadian Centre for Occupational Health and Safety \*  
\* \* \* \* \* Issue : 98-1 (February, 1998) \*

\*\*\* IDENTIFICATION \*\*\*

MSDS RECORD NUMBER : 1503453  
PRODUCT NAME(S) : **HYDROCHLORIC ACID**  
PRODUCT IDENTIFICATION : Product Number: 5090  
DATE OF MSDS : 1997-04-04

\*\*\* MANUFACTURER INFORMATION \*\*\*

MANUFACTURER : Drew Chemical Limited  
ADDRESS : 525 Finley Avenue  
Ajax Ontario  
Canada L1S 2E5  
Telephone: 905-683-0150  
Fax: 905-427-0688  
EMERGENCY TELEPHONE NO. : 905-683-0150  
800-274-5263 (After hours)  
613-996-6666 (CANUTEC, 24 hours)

\*\*\* MATERIAL SAFETY DATA \*\*\*

=====

SECTION 1 - PRODUCT INFORMATION

=====

PRODUCT NAME: **HYDROCHLORIC ACID**

PRODUCT NO.: 5090

CHEMICAL DESCRIPTION  
**Hydrochloric acid** solution

PRODUCT USES  
Test kit reagent

=====

SECTION 2 - PREPARATION INFORMATION

=====

MANUFACTURER: Drew Chemical Limited, 525 Finley Ave., Ajax, Ontario L1S 2E5  
(905) 683-0150  
PREPARED BY: Government Compliance Department

=====

SECTION 3 - HAZARDOUS INGREDIENTS

=====

COMPONENTS	%	CAS/UN NUMBER	LD50/LC50 INFORMATION
<b>hydrochloric acid</b>	10 - 30	7647-01-8	oral-rbt : 900mg/kg not available

WHMIS CLASSIFICATION OF PRODUCT  
Class E

=====

SECTION 4 - PHYSICAL DATA

=====

PHYSICAL STATE	Liquid
DENSITY	1.0004 g/ml
SPECIFIC GRAVITY	1.0004
pH/CONC	1.75
BOILING POINT	similar to water
FREEZING POINT	similar to water
VAPOR DENSITY (air=1)	similar to water
WATER/OIL DISTRIBUTION COEFF.	>1
VAPOR PRESSURE	similar to water
EVAPORATION RATE	similar to water
ODOUR THRESHOLD	not available
APPEARANCE & ODOUR	Clear colourless solution, sharp odour

=====

SECTION 5 - FIRE AND EXPLOSION DATA

=====

CONDITIONS OF FLAMMABILITY  
Does not support combustion

MEANS OF EXTINCTION  
as per surrounding fire

FLASH POINT AND METHOD  
not applicable

EXPLOSION LIMITS  
LEL (% BY VOLUME) not applicable  
UEL (% BY VOLUME) not applicable

AUTO IGNITION (°C.)  
not applicable

FLAMMABILITY CLASSIFICATION  
not flammable

HAZARDOUS COMBUSTION PRODUCTS  
hydrogen chloride gas, oxides of chlorine

SENSITIVITY TO MECHANICAL IMPACT  
not applicable

SENSITIVITY TO STATIC DISCHARGE  
not applicable

SPECIAL FIREFIGHTING PROCEDURES  
Self contained breathing apparatus if decomposition occurs.

=====

SECTION 6 - REACTIVITY DATA

=====

STABILITY  
Stable

#### CONDITIONS OF REACTIVITY

Not applicable

#### INCOMPATIBILITY (Materials to avoid)

organics, alkalies, oxidizing agents

#### HAZARDOUS DECOMPOSITION PRODUCTS

hydrogen chloride gas, oxides of chlorine

HAZARDOUS POLYMERIZATION will not occur

#### CONDITIONS TO AVOID

not applicable

### SECTION 7 - PREVENTIVE MEASURES

#### STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Stop or reduce the spill if safe to do so. Dike the spill area and pump into suitable container for re-use or disposal.

#### WASTE DISPOSAL METHODS

Dispose of waste according to local, provincial and federal regulations.

#### PERSONAL PROTECTIVE EQUIPMENT/SPECIFIC ENGINEERING CONTROLS

Rubber or neoprene gloves, goggles or face shield, apron and rubber boots. Local ventilation. Do not use in potable water systems.

#### SAFETY EQUIPMENT/HANDLING PROCEDURES

Wear suitable protection.

#### STORAGE

Store in a cool dry place. Keep lid on container when not in use.

#### SPECIAL SHIPPING INSTRUCTIONS

TDG: UN# 1760 Hazardous warning: Corrosive 8 (9.2) PKG III Proper shipping name: CORROSIVE LIQUIDS N.O.S. (**Hydrochloric acid** solution)

### SECTION 8 - TOXICOLOGICAL PROPERTIES

#### SKIN CONTACT

corrosive

#### SKIN ABSORPTION

not applicable

#### EYE CONTACT

corrosive

#### INHALATION

will irritate

#### INGESTION

can be harmful

#### EFFECT OF ACUTE EXPOSURE

Material is corrosive to skin and eyes. Inhalation of vapours may cause irritation of nasal and respiratory tract. Ingestion causes gastrointestinal tract discomfort, nausea and vomiting.

#### EFFECT OF CHRONIC EXPOSURE

same as acute

EXPOSURE LIMITS

not available

PRODUCT LD50/LC50 VALUES

not available

IRRITANCY OF PRODUCT

severe

SENSITIZATION

not available

CARCINOGENICITY

Not applicable

REPRODUCTIVE TOXICITY

Not applicable

TERATOGENICITY

Not applicable

MUTAGENICITY

Not applicable

TOXICOLOGICALLY SYNERGISTIC PRODUCTS

none known.

=====

SECTION 9 - FIRST AID MEASURES

=====

EYES

Flush with water for 15 minutes. If irritation persists seek medical attention.

SKIN

Flush with water for 15 minutes. Remove contaminated clothing if necessary. If irritation persists seek medical attention.

INHALATION

Remove to fresh air.

INGESTION

Do not induce vomiting. Give lots of water. Seek a physician.

OTHER DATA

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\*\*\*\*\*  
\* M S D S \*  
\*  
\* Canadian Centre for Occupational Health and Safety \*  
\* \*\*\*\*\* Issue : 98-1 (February, 1998) \*

\*\*\* IDENTIFICATION \*\*\*

MSDS RECORD NUMBER : 1568229  
PRODUCT NAME(S) : ANTHRACENE  
PRODUCT IDENTIFICATION : MSDS NUMBER: A7020  
PRODUCT CODE: B490  
C.A.S. NUMBER: 120-12-7  
DATE OF MSDS : 1997-09-08

\*\*\* MANUFACTURER INFORMATION \*\*\*

MANUFACTURER : Mallinckrodt Baker, Inc  
ADDRESS : 222 RED SCHOOL LANE  
PHILLIPSBURG NEW JERSEY  
U.S.A. 08865  
Telephone: 800-582-2537 (Customer Service)  
EMERGENCY TELEPHONE NO. : 908-859-2151  
800-424-9300 (CHEMTREC, USA)  
202-483-7616 (Outside USA & CANADA)  
613-996-6666 (CANUTEC)

\*\*\* MATERIAL SAFETY DATA \*\*\*

Effective Date: 09/08/97  
Supercedes: 12/08/96

MSDS MATERIAL SAFETY DATA SHEET

From: Mallinckrodt Baker, Inc.  
222 Red School Lane  
Phillipsburg, NJ 08865

CHEMTREC: 800-424-9300 (USA)  
202-483-7616  
(Outside USA & CANADA)  
CANUTEC: 613-996-6666

Emergency Telephone Number: 908-859-2151

NOTE: Use CHEMTREC and CANUTEC  
phone numbers only in the event  
of a chemical emergency.

All non-emergency questions should be directed to Customer Service  
1-800-582-2537 for assistance.

J. T. BAKER

ANTHRACENE

1. Product Identification

Synonyms: Paranaphthalene; Green Oil; Anthracene 90-953  
CAS No: 120-12-7  
Molecular Weight: 178.23  
Chemical Formula: (C6H4CH)2  
Product Codes: B490

Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
------------	--------	---------	-----------

-----  
**Anthracene**

120-12-7

99 - 100%

Yes  
=====

## Hazards Identification

### Emergency Overview

-----

WARNING! MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION.

### J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

-----

Health Rating: 1 - Slight  
Flammability Rating: 1 - Slight  
Reactivity Rating: 0 - None  
Contact Rating: 1 - Slight  
Lab Protective Equip: GOGGLES; LAB COAT  
Storage Color Code: Orange (General Storage)  
-----

### Potential Health Effects

-----

OSHA's definition for coal tar pitch volatiles includes **anthracene**. Coal tar pitch volatiles (in general) are considered to be carcinogens by NTP, IARC, and ACGIH. However, **anthracene** has been specifically evaluated by IARC and designated as Class 3 (unclassifiable as to carcinogenicity with no human evidence and limited animal evidence).

#### Inhalation:

May cause irritation to the respiratory tract.

#### Ingestion:

May cause irritation to the gastro-intestinal tract.

#### Skin Contact:

May cause irritation. Photosensitizer.

#### Eye Contact:

May cause irritation, redness and pain. Photosensitizer.

#### Chronic Exposure:

Photosensitizer. Skin pigment changes.

#### Aggravation of Pre-existing Conditions:

Individuals with dermatitis or hypersensitivity to material may be more susceptible to the effects of the substance.  
=====

## 4. First Aid Measures

#### Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

#### Ingestion:

Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

#### Skin Contact:

Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

#### Eye Contact:

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Call a physician if irritation persists.

=====

### 5. Fire Fighting Measures

#### Fire:

Flash point: 121C (250F) CC

Low fire hazard when exposed to heat or flames.

#### Explosion:

Above the flash point, explosive vapor-air mixtures may be formed. Will burst into flame on contact with chromic acid.

#### Fire Extinguishing Media:

Water spray, dry chemical, alcohol foam, or carbon dioxide.

#### Special Information:

In the event of a fire, wear full protective clothing and MIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

=====

### 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

=====

### 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

=====

### 8. Exposure Controls/Personal Protection

#### Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):

0.2 mg/m<sup>3</sup> (TWA) for coal tar pitch volatiles

ACGIH Threshold Limit Value (TLV):

0.2 mg/m<sup>3</sup> (TWA) for coal tar pitch volatiles

A1: Confirmed human carcinogen.

#### Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne

Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. Respirator manufacturer may have other specific cartridge recommendations.

Skin Protection:

Gloves and lab coat, apron or coveralls.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Yellow crystals with green fluorescence.

Boiling Point:

340C (644F)

Odor:

Faint aromatic odor.

Melting Point:

217C (423F)

Solubility:

Insoluble in water.

Vapor Density (Air=1):

6.15

Density:

1.24

Vapor Pressure (mm Hg):

1 @ 145C (293F) (sublimes)

pH:

No information found.

Evaporation Rate (BuAc=1):

No information found.

% Volatiles by volume @ 21C (70F):

0

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Darkens on exposure to light.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Fluorine, chromic acid, oxidizing agents.

Conditions to Avoid:

No information found.

## 11. Toxicological Information

Oral mouse LD: > 17,000 mg/kg. Irritation skin, Draize mouse: 118 ug mild. Investigated as a tumorigen and mutagen. IARC 3.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Anthracene (120-12-7)	No	No	3

## 12. Ecological Information

### Environmental Fate:

When released into the soil, this material is not expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may biodegrade to a moderate extent. This material has an experimentally-determined bioconcentration factor (BCF) of greater than 100. This material may bioaccumulate to some extent. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.

### Environmental Toxicity:

The LC50/96-hour values for fish are between 10 and 100 mg/l. This material may be toxic to aquatic life.

## 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

## 14. Transport Information

Not regulated.

## 5. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Anthracene (120-12-7)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	--Canada--		Phil.
		DSL	NDSL	
Anthracene (120-12-7)	Yes	Yes	No	Yes

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**Abstract**

RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

\*\*\*\*\*  
Prepared by: Strategic Services Division

Phone Number: (314) 539-1600 (U.S.A.)

A7020

-----  
MSDS for ACENAPHTHENEPage 1  
----------  
1 - PRODUCT IDENTIFICATION  
-----

PRODUCT NAME: ACENAPHTHENE  
FORMULA: C<sub>10</sub>H<sub>6</sub>-1,8-CH<sub>2</sub>CH<sub>2</sub>  
FORMULA WT: 154.21  
CAS NO.: 83-32-9  
COMMON SYNONYMS: 1,2-DIHYDROACENAPHTHYLENE; 1,8-ETHYLENENAPHTHALENE  
PRODUCT CODES: 4871  
EFFECTIVE: 10/03/86  
REVISION #02

## PRECAUTIONARY LABELLING

## PRECAUTIONARY LABEL STATEMENTS

WARNING  
CAUSES IRRITATION

HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN  
THERE IS INSUFFICIENT DATA IN THE PUBLISHED LITERATURE TO ASSIGN COMPLETE  
NUMERICAL SAF-T-DATA RATINGS AND LABORATORY PROTECTIVE EQUIPMENT FOR THIS  
PRODUCT. SPECIAL PRECAUTIONS MUST BE USED IN STORAGE, USE AND HANDLING.  
PROTECTIVE EQUIPMENT FOR LABORATORY BENCH USE SHOULD BE CHOSEN USING  
PROFESSIONAL JUDGMENT BASED ON THE SIZE AND TYPE OF REACTION OR TEST TO BE  
CONDUCTED AND THE AVAILABLE VENTILATION, WITH OVERRIDING CONSIDERATION TO  
MINIMIZE CONTACT WITH THE CHEMICAL.  
AVOID CONTACT WITH EYES, SKIN, CLOTHING.  
KEEP IN TIGHTLY CLOSED CONTAINER. WASH THOROUGHLY AFTER HANDLING.

-----  
2 - HAZARDOUS COMPONENTS  
-----

COMPONENT	%	CAS NO.
ACENAPHTHENE	90-100	83-32-9

-----  
3 - PHYSICAL DATA  
-----

BOILING POINT: 279 C ( 534 F) VAPOR PRESSURE(MM HG): N/A  
MELTING POINT: 95 C ( 203 F) VAPOR DENSITY(AIR=1): 5.32  
SPECIFIC GRAVITY: 1.02 EVAPORATION RATE: N/A  
(H<sub>2</sub>O=1) (BUTYL ACETATE=1)  
SOLUBILITY(H<sub>2</sub>O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0  
APPEARANCE & ODOR: WHITE TO OFF-WHITE CRYSTALS.

-----  
4 - FIRE AND EXPLOSION HAZARD DATA  
-----

2/18/98

11:14:14 PM

-----  
MSDS for ACENAPHTHENEPage 2  
-----

FLASH POINT: N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

## FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

## SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED  
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

## TOXIC GASES PRODUCED

CARBON MONOXIDE, CARBON DIOXIDE

-----  
5 - HEALTH HAZARD DATA  
-----

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

## EFFECTS OF OVEREXPOSURE

DUST INHALATION MAY CAUSE TIGHTNESS AND PAIN IN CHEST, COUGHING, AND  
DIFFICULTY IN BREATHING.

CONTACT WITH SKIN OR EYES MAY CAUSE IRRITATION.

## TARGET ORGANS

NONE IDENTIFIED

## MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

## ROUTES OF ENTRY

INHALATION, SKIN CONTACT, EYE CONTACT, INGESTION

## EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL  
RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT  
LEAST 15 MINUTES. FLUSH SKIN WITH WATER.-----  
6 - REACTIVITY DATA  
-----

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

INCOMPATIBLES: STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

-----  
7 - SPILL AND DISPOSAL PROCEDURES  
-----

---

MSDS for ACENAPHTHENEPage 3

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## STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.  
WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND  
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

## DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL  
ENVIRONMENTAL REGULATIONS.

---

8 - PROTECTIVE EQUIPMENT

---

## EYE/SKIN PROTECTION:

SINCE SOME OF THE HAZARDS OF THIS PRODUCT ARE  
UNKNOWN, AN INDUSTRIAL HYGIENIST SHOULD BE  
CONSULTED ON VENTILATION AND PERSONAL PROTECTIVE  
EQUIPMENT. COVER THE BODY AS MUCH AS POSSIBLE TO  
AVOID CONTACT WITH THE CHEMICAL. WEAR SAFETY  
GOGGLES, GLOVES, AND IMPERVIOUS CLOTHING.

---

9 - STORAGE AND HANDLING PRECAUTIONS

---

## SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE  
AREA.

---

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

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## DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	ACENAPHTHENE
HAZARD CLASS	ORM-E
LABELS	NONE
REPORTABLE QUANTITY	100 LBS.

## INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	CHEMICALS, N.O.S. (NON-REGULATED)
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\* \* \* \* \*  
\* M S D S \*  
\* \*  
\* Canadian Centre for Occupational Health and Safety \*  
\* \* \* \* \* Issue : 98-1 (February, 1998) \*

\*\*\* IDENTIFICATION \*\*\*

MSDS RECORD NUMBER : 1274568  
PRODUCT NAME(S) : coal tar creosote treated wood  
DATE OF MSDS : 1994-07-28

\*\*\* MANUFACTURER INFORMATION \*\*\*

MANUFACTURER : Kerr-McGee Chemical Corporation  
ADDRESS : Kerr-McGee Center  
Oklahoma City Oklahoma  
U.S.A. 73125  
EMERGENCY TELEPHONE NO. : 405-270-1313 (24 hours)  
MANUFACTURER NOTE :  
For more detailed information on the hazards of this product, contact  
Regulatory Compliance Department or Medical Services Department at the address  
above. Technical Information Bulletin is also available.

\*\*\* MATERIAL SAFETY DATA \*\*\*

MATERIAL SAFETY DATA SHEET

coal tar creosote treated wood

1. CHEMICAL PRODUCT

PRODUCT IDENTIFICATION

Chemical Name ..... N/A  
Common Name..... Coal Tar Creosote Treated Wood  
Formula ..... N/A  
Molecular Weight ..... N/A

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS NUMBER	WEIGHT %
Coal Tar Creosote	8001-58-9	7-25 lbs/cu. ft.
Wood dust - Particles of varying size produced by any manual or mechanical cutting, chipping, sawing, or sanding of wood.	N/A	N/A

(Note: See Section 8 of this MSDS for Exposure Guidelines)

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Wood and wood particles of varying size and color, which depend upon the  
specific species of wood and operation producing them.

WARNING! Harmful if wood dust or preservative vapors are inhaled. May  
cause eye and skin irritation.

Burning treated wood may produce toxic and irritating gases or fumes.  
Finely divided wood dust is a fire and explosion hazard when exposed to

heat, sparks, or flame. Use water spray, fog, foam, dry chemical, or CO2.

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#### POTENTIAL HEALTH EFFECTS

##### PRIMARY ROUTE(S) OF ENTRY

Inhalation (breathing); eye and skin contact.

**WARNING!** Harmful if wood dust or preservative vapors are inhaled; may cause irritation to the nose throat, and lungs. Prolonged exposure can lead to inflammation of the nasal passages (rhinitis), lung disease (bronchitis), or asthma. Dust or preservative (liquid or vapors) may cause eye or skin irritation. Repeated or prolonged exposure to the eye may cause conjunctivitis, or to the skin may cause allergic dermatitis. Animal studies indicate that prolonged skin exposure to creosote can cause cancer.

##### SYMPTOMS OF EXPOSURE

Inhalation: Sneezing, coughing, runny nose, nose bleeds, fever, muscular aches and pains, difficult breathing, or wheezing, depending upon the species. Breathing preservative vapors may cause headache, drowsiness, and possible weakness and incoordination.

Eye Contact: Tearing, burning.

Skin Contact: Irritation, redness, scaling, itching.

##### MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Pre-existing eye or skin disease, breathing or respiratory disease or disorders, sinus problems.

##### REPORTED AS CARCINOGEN OR POTENTIAL CARCINOGEN

☐ Not Applicable  
☒ National Toxicology Program (NTP)  
☐ OSHA  
☒ International Agency for Research on Cancer (IARC)  
(See also Section 11.)

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#### 1. FIRST AID MEASURES

##### INHALATION

Remove from area to fresh air. Seek medical attention if respiratory irritation develops or if breathing becomes difficult.

##### EYE CONTACT

Immediately rinse eyes with water. Remove any contact lenses, and continue flushing eyes with running water for at least 15 minutes. Hold eyelids apart to ensure rinsing of the entire surface of the eyes and lids with water. Get immediate medical attention.

##### SKIN CONTACT

Wash affected areas with plenty of water, and soap if available, for several minutes. Remove and clean contaminated clothing and shoes. Seek medical attention if irritation develops or persists.

##### INGESTION

Give 3-4 glasses of water. Induce vomiting by placing a finger or blunt object on the back of the victim's tongue. Give fluids until vomitus is clear. Do not induce vomiting or give anything by mouth to an unconscious or convulsing person. Seek medical attention.

##### NOTE TO PHYSICIAN

Chemical of exposure is wood treated with coal tar creosote or dust from this wood. Both the preservative, coal tar creosote, and wood dust are eye, skin, and respiratory tract irritants. Creosote may result in a sunlight induced phototoxic skin reaction. Wood dust is a potential respiratory and skin sensitizer.

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#### 2. FIRE FIGHTING MEASURES

Flash Point and Method ..... N/A

#### GENERAL HAZARD

Finely divided wood dust is a strong to severe explosion hazard. Burning coal tar creosote treated wood can produce toxic and irritating gases or fumes.

#### EXTINGUISHING MEDIA

For small fires, use water spray, foam, CO2, or dry chemical. For large fires, use water spray, fog, or alcohol foam.

#### SPECIAL FIREFIGHTING INSTRUCTIONS

Use water to wet down wood dust to prevent generation of dust clouds. Remove burnt or wet wood dust to an open area after fire is extinguished.

#### FIREFIGHTING EQUIPMENT

As in any fire, wear NIOSH/MSHA approved, pressure-demand self-contained breathing apparatus and full protective gear.

### 6. ACCIDENTAL RELEASE MEASURES

Wear appropriate protective equipment (See Section 8).

#### ON LAND

Avoid generating dusts. Sweep up dust and place in a container for later disposal.

### 7. HANDLING AND STORAGE

#### HANDLING

Wear appropriate protective equipment (See Section 8). Avoid breathing dust and contact with eyes or skin. Wash thoroughly after handling.

#### STORAGE

Store in a dry place, away from heat, sparks, flame, or other sources of ignition. Keep away from oxidizers.

### 8. EXPOSURE CONTROL/PERSONAL PROTECTION

#### ENGINEERING CONTROLS

If user operations generate wood dust, use explosion-proof ventilation equipment to assure airborne levels are below established exposure limits. Use local exhaust and general ventilation techniques to assure that exposure levels of creosote are met.

#### PERSONAL PROTECTION

**Respirator:** In operations where dusts or preservative vapors exceeding the exposure limits are generated, use a NIOSH/MSHA approved mask that has been selected by an industrial hygienist or other technically qualified person for the specific work conditions.

**Eye Protection:** Safety glasses or vented safety goggles.

**Gloves:** To protect exposed skin against the phototoxicity of creosote, apply commercially available sun block agents (Sun Protection Factor > 15) under barrier creams. Wear gloves of material that is impermeable to creosote.

**Clothing:** Wear easily washable clothing. Wash clothing after each shift, or more often if clothing becomes contaminated.

**Other:** Eye wash.

#### EXPOSURE CONTROLS

##### COMPONENT

OSHA PEL  
TWA STEL

ACGIH TLV  
TWA STEL

Coal tar pitch volatiles, as benzene solubles	0.2 mg/m3	N/E	0.2 mg/m3	N/E
Wood dust (certain hardwoods as beech & oak)	N/E	N/E	1 mg/m3	N/E
Wood dust - Soft wood	N/E	N/E	5 mg/m3	10 mg/m3

## 9. PHYSICAL AND CHEMICAL PROPERTIES

State .....	Solid
Color .....	Varies, depending upon wood species
Odor .....	Varies, depending upon wood species
Melting Point (deg) C .....	N/A
Boiling Point (deg) C .....	N/A
Bulk Density, lb/cu. ft .....	N/D
Weight Per Gallon .....	N/A
Specific Gravity @ 20 deg C .....	N/D
Water Solubility .....	Insoluble
pH .....	N/A

## 10. STABILITY AND REACTIVITY

### REACTIVITY

Stable

### INCOMPATIBILITIES

Strong oxidizers.

### HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide and/or carbon dioxide as well as toxic coal tar fumes.

### CONDITIONS TO AVOID

Dust generation; sources of ignition.

## 11. TOXICOLOGICAL INFORMATION

For Beech Wood Dust, Extract:

RTECS ZC9850000

Dermal TDLo (mouse) ..... 3,900 gm/kg; Effect: tumorigenic

The Furniture and Cabinet Making Wood Industries have been identified by the International Agency for Research on Cancer (IARC) as a positive human carcinogen. An excess risk of nasal adenocarcinoma has been reported mainly in those workers in this industry exposed to wood dusts.

Some studies have suggested that workers in the Lumber and Sawmill, and Pulp and Paper Industries and in the Carpentry and Joinery Trades may have an increased incidence in nasal cancers and Hodgkin's Disease. However, IARC concluded that the epidemiological data do not permit a definite assessment.

For Creosote:

RTECS

Dermal TDLo (mouse) ..... 99 gm/kg/33W/I; Effect: tumorigenic

Oral LD50 (rat) ..... 725 mg/kg

Oral LD50 (mouse) ..... 433 mg/kg

Creosote has been categorized as a Group 2A carcinogen (Probably carcinogenic to humans) by IARC, it is listed under "Soots, tars, and mineral oils" as a potential human carcinogen by the National Toxicology Program (NTP).

## 12. ECOLOGICAL INFORMATION

For a 60:40 mixture of creosote and coal tar:

Hazardous Substance Data Bank

24 hr. TL50 (goldfish) ..... 3.51 ppm  
24 hr. TL50 (bluegill) ..... 4.42 ppm  
24 hr. TL50 (rainbow trout) .... 3.72 ppm  
LD50 (bob white quail) ..... 1,260 ppm/8 days (unspecified route)  
LD50 (mallard duck) ..... 10,388 ppm/8 days (unspecified route)

### 13. DISPCAL CONSIDERATIONS

RCRA Waste Code: ..... U051 (Creosote)

Treated wood should not be burned in open fires or in stoves, fireplaces, or residential boilers.

Creosote and hazardous debris contaminated with this preservative are prohibited from land disposal unless treated according to the standards in 40 CFR 268.45.

### 14. TRANSPORT INFORMATION

DOT Hazard Class .... Not Regulated

### 15. REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200)

☒ Hazardous                      ☐ Non-Hazardous

CERCLA/SUPERFUND (40 CFR 117, 302)

Chemical Name	RQ (lbs)
Creosote	1

SARA EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355)

Chemical Name	TPQ (lbs)
N/A	N/A

SARA HAZARD CATEGORIES (40 CFR 370)

☒ Acute   ☒ Chronic   ☐ Fire   ☐ Pressure   ☐ Reactive   ☐ None

SARA TOXIC SUBSTANCES (40 CFR 372)

Chemical Name	CAS Number	Content
Creosote	8001-58-9	7-25 lbs/ft3 (12-33% by weight, assuming wood density of 50 lbs/ft3)

TOXIC SUBSTANCES CONTROL ACT

Wood and wood dusts are listed in the TSCA Inventory under the category "Naturally Occurring Chemical Substances" (40 CFR 710.4(b)); Creosote is listed on the TSCA Inventory.

STATE REGULATIONS

California Proposition 65 ..... WARNING: This product contains creosote, a chemical known to the State of California to cause cancer.

Florida Hazardous Substance List ..... Creosote: Present  
Massachusetts Right To Know List ..... Creosote: Carcinogen; extraordinarily  
hazardous  
Minnesota Hazardous Substance List .... Creosote: Carcinogen  
New Jersey Right To Know List ..... Creosote: substance No. 0517; Special  
Health Hazard: Carcinogen  
Pennsylvania Right To Know List ..... Creosote: Special Hazardous Substance

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16. OTHER INFORMATION

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ABBREVIATIONS

C - Ceiling limit  
N/A - Not applicable  
N/D - Not determined  
I/E - Not established  
N/K - Not known  
RQ - Reportable Quantity  
TPQ - Threshold Planning Quantity  
MSDS No. .... Not Applicable  
Date of Issue: .... July 28, 1994  
Coal Tar Creosote Treated Wood

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\* M S D S \*  
\* \*  
\* Canadian Centre for Occupational Health and Safety \*  
\* \* \* \* \* Issue : 98-1 (February, 1998) \*

\*\*\* IDENTIFICATION \*\*\*

MSDS RECORD NUMBER : 1569226  
PRODUCT NAME(S) : NAPHTHALENE  
PRODUCT IDENTIFICATION : MSDS NUMBER: N0090  
PRODUCT CODE: 2718, 6348  
C.A.S. NUMBER: 91-20-3  
DATE OF MSDS : 1997-09-08

\*\*\* MANUFACTURER INFORMATION \*\*\*

MANUFACTURER : Mallinckrodt Baker, Inc  
ADDRESS : 222 RED SCHOOL LANE  
PHILLIPSBURG NEW JERSEY  
U.S.A. 08865  
Telephone: 800-582-2537 (Customer Service)  
EMERGENCY TELEPHONE NO. : 908-859-2151  
800-424-9300 (CHEMTREC, USA)  
202-483-7616 (Outside USA & CANADA)  
613-996-6666 (CANUTEC)

\*\*\* MATERIAL SAFETY DATA \*\*\*

Effective Date: 09/08/97  
Supersedes: 12/08/96

MSDS MATERIAL SAFETY DATA SHEET

From: Mallinckrodt Baker, Inc.  
222 Red School Lane  
Phillipsburg, NJ 08865

CHEMTREC: 800-424-9300 (USA)  
202-483-7616  
(Outside USA & CANADA)  
CANUTEC: 613-996-6666

Emergency Telephone Number: 908-859-2151

NOTE: Use CHEMTREC and CANUTEC  
phone numbers only in the event  
of a chemical emergency.

All non-emergency questions should be directed to Customer Service  
(1-800-582-2537) for assistance.

M A L L I N C K R O D T

J T. B A K E R

NAPHTHALENE

1. Product Identification

Synonyms: Naphthene; mothballs; tar camphor; naphthalin;  
white-tar  
CAS No: 91-20-3  
Molecular Weight: 128.16  
Chemical Formula: C10H8  
Product Codes: J.T. Baker:  
2718  
Mallinckrodt:  
6348

## 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Naphthalene	91-20-3	90 - 100%	Yes

## 3. Hazards Identification

### Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION. MAY AFFECT LIVER, KIDNEY, BLOOD AND CENTRAL NERVOUS SYSTEM. COMBUSTIBLE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight  
Flammability Rating: 2 - Moderate  
Reactivity Rating: 0 - None  
Contact Rating: 1 - Slight  
Lab Protective Equip: GOGGLES; LAB COAT  
Storage Color Code: Red (Flammable)

### Potential Health Effects

#### Inhalation:

Inhalation of dust or vapors can cause headache, nausea, vomiting, extensive sweating, and disorientation. The predominant reaction is delayed intravascular hemolysis with symptoms of anemia, fever, jaundice, and kidney or liver damage.

#### Ingestion:

Toxic. Can cause headache, profuse perspiration, listlessness, dark urine, nausea, vomiting and disorientation. Intravascular hemolysis may also occur with symptoms similar to those noted for inhalation. Severe cases may produce coma with or without convulsions. Death may result from renal failure.

#### Skin Contact:

Can irritate the skin and, on prolonged contact, may cause rashes and allergy. "Sensitized" individuals may suffer a severe dermatitis.

#### Eye Contact:

Vapors and solid causes irritation, redness and pain. Very high exposures can damage the nerves of the eye.

#### Chronic Exposure:

Has led to cataract formation in eyes. May cause skin allergy.

#### Aggravation of Pre-existing Conditions:

Persons with pre-existing skin, blood or vascular disorders or impaired respiratory function may be more susceptible to the effects of the substance. Particularly susceptible individuals are found in the general population, most commonly in dark skinned races.

## 4. First Aid Measures

### Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

**Ingestion:**

Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

**Skin Contact:**

Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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**5. Fire Fighting Measures**

**Fire:**

Flash point: 87C (189F) CC

Autoignition temperature: 526C (979F)

Combustible. May be ignited by heat, sparks or flame. May burn rapidly with flare-burning effect. Fire may produce irritating or poisonous gases.

**Explosion:**

Explosive limits, volume % in air: lel: 0.9; uel: 5.9. Above flashpoint, vapor-air mixtures are explosive within flammable limits noted above. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire or explosion.

**Fire Extinguishing Media:**

Dry chemical, foam, water or carbon dioxide. Foam or direct water spray on molten **naphthalene** may cause extensive foaming. Molten naphthalene spatters in contact with water; apply water from as far a distance as possible.

**Special Information:**

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

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**6. Accidental Release Measures**

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8.

Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-3802.

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**7. Handling and Storage**

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Keep away from moisture and oxidizers. Containers of this material may be hazardous when empty since they retain product residues

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(dust, solids); observe all warnings and precautions listed for the product.

#### Exposure Controls/Personal Protection

##### Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL):  
10 ppm, 50 mg/m<sup>3</sup>.

- ACGIH Threshold Limit Value (TLV):

TWA= 10 ppm, 52 mg/m<sup>3</sup>  
STEL= 15 ppm, 79 mg/m<sup>3</sup>.

##### Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

##### Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face respirator with an organic vapor cartridge and dust/mist filter may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an organic vapor cartridge and dust/mist filter may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

##### Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

##### Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

## 9. Physical and Chemical Properties

Appearance:  
White crystals.

Boiling Point:  
218C (424F)

Odor:  
Strong coal tar odor (moth balls).

Melting Point:  
80C (176F)

Solubility:  
Insoluble in water.

Vapor Density (Air=1):  
4.4

Specific Gravity:  
1.2

Vapor Pressure (mm Hg):  
1 @ 53C (127F)

pH:  
No information found.

Evaporation Rate (BuAc=1):  
< 1

3 Volatiles by volume @ 21C (70F):  
No information found.

## Stability and Reactivity

### Stability:

Stable at room temperature in sealed containers. Sublimes appreciably at temperatures above melting point.

### Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

### Hazardous Polymerization:

Will not occur.

### Incompatibilities:

Strong oxidizers, strong alkalis and strong mineral acids, mixtures of aluminum trichloride and benzoyl chloride. Reacts violently with chromic anhydride. Melted naphthalene will attack some forms of plastics, rubber, and coatings.

### Conditions to Avoid:

Avoid heat, sparks, flames and other ignition sources and incompatibles.

## 11. Toxicological Information

Oral rat LD50: 490 mg/kg;

Inhalation rat LC50: 340 mg/m3, 1 hour;

Skin rabbit LD50: > 20 g/kg;

Irritation data: skin (open Draize, rabbit 495 mg, mild; eye (standard Draize) rabbit 100 mg, mild;

Investigated as a tumorigen, mutagen and reproductive effector.

-----\Cancer Lists\-----

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Naphthalene (91-20-3)	No	No	None

## 12. Ecological Information

### Environmental Fate:

When released into the soil, this material may biodegrade to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material may bioaccumulate to some extent. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day.

### Environmental Toxicity:

No information found.

## 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

#### 4. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: **NAPHTHALENE, REFINED**  
Hazard Class: 4.1  
UN/NA: UN1334 Packing Group: III  
Information reported for product/size: 1KG

International (Water, I.M.O.)

Proper Shipping Name: **NAPHTHALENE, REFINED**  
Hazard Class: 4.1  
UN/NA: UN1334 Packing Group: III  
Information reported for product/size: 1KG

International (Air, I.C.A.O.)

Proper Shipping Name: **NAPHTHALENE, REFINED**  
Hazard Class: 4.1  
UN/NA: UN1334 Packing Group: III  
Information reported for product/size: 1KG

#### 5. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Naphthalene (91-20-3)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	DSL	NDSL	Phil.
Naphthalene (91-20-3)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302- RQ	TPQ	-SARA 313- List	Chemical Catg.
Naphthalene (91-20-3)	No	No	Yes	No

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Naphthalene (91-20-3)	100	U165	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No  
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No  
Reactivity: No (Pure / Solid)

Australian Hazchem Code: 22

Australian Poison Schedule: S6

WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

## 16. Other Information

### NFPA Ratings:

Health: 2 Flammability: 2 Reactivity: 0

### Label Hazard Warning:

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION. MAY AFFECT LIVER, KIDNEY, BLOOD AND CENTRAL NERVOUS SYSTEM. COMBUSTIBLE.

### Label Precautions:

Avoid contact with eyes, skin and clothing.  
Avoid prolonged or repeated contact with skin.  
Avoid breathing dust.  
Avoid breathing vapor.  
Keep container closed.  
Use only with adequate ventilation.  
Wash thoroughly after handling.  
Keep away from heat, sparks and flame.

### Label First Aid:

In all cases call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person.

### Product Use:

Laboratory Reagent.

### Revision Information:

MSDS Section(s) changed since last revision of document include: 15.

### Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared by: Strategic Services Division

Phone Number: (314) 539-1600 (U.S.A.)

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\* M S D S \*  
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\* Canadian Centre for Occupational Health and Safety \*  
\* \* \* \* \* Issue : 98-1 (February, 1998) \*

\*\*\* IDENTIFICATION \*\*\*

MSDS RECORD NUMBER : 1568775  
PRODUCT NAME(S) : ETHYL BENZENE  
PRODUCT IDENTIFICATION : MSDS NUMBER: E3050  
PRODUCT CODE: 2427  
C.A.S. NUMBER: 100-41-4  
DATE OF MSDS : 1997-09-08

\*\*\* MANUFACTURER INFORMATION \*\*\*

MANUFACTURER : Mallinckrodt Baker, Inc  
ADDRESS : 222 RED SCHOOL LANE  
PHILLIPSBURG NEW JERSEY  
U.S.A. 08865  
Telephone: 800-582-2537 (Customer Service)  
EMERGENCY TELEPHONE NO. : 908-859-2151  
800-424-9300 (CHEMTREC, USA)  
202-483-7616 (Outside USA & CANADA)  
613-996-6666 (CANUTEC)

\*\*\* MATERIAL SAFETY DATA \*\*\*

Effective Date: 09/08/97  
Supercedes: 12/08/96

MSDS MATERIAL SAFETY DATA SHEET

From: Mallinckrodt Baker, Inc.  
222 Red School Lane  
Phillipsburg, NJ 08865

CHEMTREC: 800-424-9300 (USA)  
202-483-7616  
(Outside USA & CANADA)  
CANUTEC: 613-996-6666

Emergency Telephone Number: 908-859-2151

NOTE: Use CHEMTREC and CANUTEC  
phone numbers only in the event  
of a chemical emergency.

All non-emergency questions should be directed to Customer Service  
(1-800-582-2537) for assistance.

MALLINCKRODT

ETHYL BENZENE

1. Product Identification

Synonyms: Benzene, ethyl; ethylbenzen 99%; ethyl benzol  
CAS No: 100-41-4  
Molecular Weight: 106.17  
Chemical Formula: C6H5C2H5  
Product Codes: 2427

Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
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Ethyl Benzene

100-41-4

1.00%

Yes  
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## Hazards Identification

### Emergency Overview

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WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. VAPOR OR MIST IS IRRITATING TO THE EYES AND UPPER RESPIRATORY TRACT. CAUSES SKIN IRRITATION. AFFECTS CENTRAL NERVOUS SYSTEM.

### Potential Health Effects

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#### Inhalation:

Vapors irritate the mucous membranes and respiratory tract. May cause coughing, headache, Labored breathing, dizziness and unconsciousness. May affect blood circulation.

#### Ingestion:

Harmful if swallowed. Aspiration into the lungs may cause pneumonia. Abdominal pain, nausea, vomiting may occur. May affect central nervous system.

#### Skin Contact:

Causes irritation with redness and pain. Prolonged contact may cause dermatitis.

#### Eye Contact:

Vapors irritate the eyes, causing redness, pain, blurred vision.

#### Chronic Exposure:

Chronic exposure may cause fatigue, sleepiness, headache, and irritation of the eyes, respiratory tract and skin.

#### Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

=====

## 4. First Aid Measures

#### Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

#### Ingestion:

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

#### Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

#### Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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## 5. Fire Fighting Measures

### Fire:

Flash point: 21C (70F) CC

Autoignition temperature: 432C (810F)

Flammable limits in air % by volume:

lcl: 0.8; ucl: 6.7

Flammable Liquid and Vapor! Liquid floats on water and may travel to a source of ignition and spread the fire.

### Explosion:

Sealed containers may rupture when heated. Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

### Fire Extinguishing Media:

Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool.

### Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

=====

## 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

=====

## 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

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## 8. Exposure Controls/Personal Protection

#### Airborne Exposure Limits:

##### For Ethyl Benzene:

- OSHA Permissible Exposure Limit (PEL) - 100 ppm (TWA)
- ACGIH Threshold Limit Value (TLV) - 100 ppm (TWA), 125 ppm (STEL)

#### Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

#### Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

#### Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

#### Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

=====

### 9. Physical and Chemical Properties

Appearance:  
Clear, colorless liquid.

Boiling Point:  
136C (277F)

Odor:  
Aromatic odor.

Melting Point:  
-95C (-139F)

Solubility:  
Insoluble in water.

Vapor Density (Air=1):  
3.66

Specific Gravity:  
0.867 @ 20C/4C

Vapor Pressure (mm Hg):  
10 @ 25.9C (79F)

pH:  
No information found.

Evaporation Rate (BuAc=1):  
< 1

% Volatiles by volume @ 21C (70F):  
No information found.

=====

### 10. Stability and Reactivity

Stability:  
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Contact with strong oxidizing agents may cause fires and explosions.

Attacks many plastics.

Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

For Ethyl Benzene - Oral rat LD50: 3500 mg/Kg; Skin rabbit LD50:17800 mg/Kg. Investigated as a tumorigen, mutagen, reproductive effector.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Ethyl Benzene (100-41-4)	No	No	None

12. Ecological Information

Environmental Fate:

When released into water, this material is expected to readily biodegrade. When released to water, this material is expected to quickly evaporate. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is not expected to be degraded by photolysis.

Environmental Toxicity:

The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ETHYLBENZENE

Hazard Class: 3

UN/NA: UN1175

Packing Group: II

Information reported for product/size: 3KG

International (Water, I.M.O.)

Proper Shipping Name: ETHYLBENZENE

Hazard Class: 3.2

UN/NA: UN1175

Packing Group: II

Information reported for product/size: 3KG

## 15. Regulatory Information

Ingredient	TSCA	EC	Japan	Australia
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes

Ingredient	-SARA 302- RQ	TPQ	-SARA 313- List	Chemical Catg.
Ethyl Benzene (100-41-4)	No	No	Yes	No

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Ethyl Benzene (100-41-4)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No  
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No  
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 3[Y]E

Australian Poison Schedule: No information found.

WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

## 16. Other Information

NFPA Ratings:

Health: 2 Flammability: 3 Reactivity: 0

Label Hazard Warning:

WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED.  
VAPOR OR MIST IS IRRITATING TO THE EYES AND UPPER RESPIRATORY TRACT.  
CAUSES SKIN IRRITATION. AFFECTS CENTRAL NERVOUS SYSTEM.

Label Precautions:

Keep away from heat, sparks and flame.  
Keep container closed.  
Use only with adequate ventilation.  
Avoid contact with eyes, skin and clothing.  
Avoid breathing vapor or mist.  
Wash thoroughly after handling.

Label First Aid:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:  
Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16.

Disclaimer:

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E3050

**ATTACHMENT D**

**Confined Space Entry Supplement**

## 1.0 INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) estimates that millions of workers may be exposed to hazards in confined spaces each year. The nature of a confined space increases the likelihood of encountering a toxic, flammable, or oxygen deficient atmosphere, because the confined space encourages accumulation of gases and vapors. While complete data is difficult to obtain, studies have suggested that as many as two-thirds of all confined space fatalities are potential rescuers. For every one worker fatality record, two additional fatalities occur during rescue attempts. The main reason this occurs is that workers do not recognize the hazard presented by the confined space. Examples of confined spaces include storage tanks, process vessels, trenches, manholes, boilers, pits, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines.

Specific standards for confined space entry have recently been finalized by the Occupational Safety and Health Administration (OSHA) under 29 CFR Part 1910.146. The final rule for Permit-Required Confined Space Entry was published in the Federal Register on January 14, 1993.

The following document provides safety procedures to be followed if entry into a confined space is necessary. It is assumed that no entry into a confined space is necessary; but if entry does become necessary, the provisions of this section shall be followed.

The confined space entry program is based upon a system which (1) identifies the permit space, (2) restricts the area so that only authorized personnel may enter, (3) controls the hazards through engineering or work practices, and (4) tests, monitors, or inspects the spaces to ensure that the hazards remain under control. For more information regarding general safety at the Site, consult the general Health and Safety Plan.

## **2.0 PROCEDURES FOR ENTRY INTO A CONFINED SPACE**

### **2.1 Duties of Personnel Involved in Confined Space Entry**

Prior to entry, each person involved should review and understand his or her respective responsibilities under the confined space entry program.

Attendant - Duties of the attendant include:

1. knowing the hazards that may be encountered during entry;
2. being aware of possible behavioral effects of hazardous exposure to authorized entrants;
3. continuously maintaining an accurate account of authorized entrants in the permit space and ensuring accurate identification of each authorized entrant;
4. remaining outside the permit space during entry operations until relieved by another attendant;
5. communicating with authorized entrants (two-way radios, if necessary);
6. monitoring activities inside and outside the space;
7. summoning rescue and other emergency services;
8. barring unauthorized persons from entering or approaching the permit space; and
9. performing non-entry rescues as specified by the rescue procedures.

The attendant's presence outside the permit space is vital even after an emergency has arisen. However, in an emergency situation, after an attendant is relieved by someone who assumes the attendant's required duties, the original attendant, if trained and equipped as required, can safely enter the permit space to begin a prescribed rescue attempt if non-entry rescue is not feasible.

Entry Supervisor - Duties of the entry supervisor include:

1. evaluating the conditions in and around any permit space that is to be entered;
2. overseeing entry operations, as necessary, to determine if the conditions are acceptable for entry;
3. where acceptable entry conditions are present, either authorizing entry to begin or allowing entry operations that are already underway to continue;
4. authorizing entry permits and canceling permits;
5. taking the necessary measures to protect personnel from permit space hazards; and
6. establishing respiratory protection levels based on initial and on-going atmospheric monitoring in the confined space.

Where acceptable entry conditions are not present, the entry supervisor either prohibits entry or, if entry is already underway, orders the authorized entrants out of the permit space and cancels the entry permit.

In situations where there are only a few employees, the entry supervisor may serve as an attendant or an authorized entrant as long as the entry supervisor is trained and equipped for each role he or she fills. All pertinent duties relating to the duties of attendants and authorized entrants would still apply to the entry supervisor who serves as an attendant or an authorized entrant.

## **2.2 Pre-Entry Procedures**

The following procedures must be completed prior to initiating confined space entry.

### **2.2.1 Posting Signs**

Where any confined space is considered a permit-required confined space, warning signs reading "Danger - Permit-Required Confined Space, Do Not Enter" or other similar language is required. However, if the only means of access necessitates the use of tools or keys, then the warning sign is

not required provided that the employees are trained to recognize the hazards involved.

### **2.2.2 Work Area Isolation**

Isolating the confined space entry area requires banning smoking, open flames and other sources of ignition. Electrical and internal combustion equipment should be removed from the area and kept at a minimum distance of fifty feet in the upwind direction from the work area. If the electricity can be terminated outside the confined space, the electrical equipment (i.e. pump) does not need to be removed. *If applicable, termination must be performed by removing fuses or de-energizing the circuit breaker at the breaker box and locking the box so that only the attendant can gain access. The fuses should be retained by the attendant. Additionally, an electrician experienced in such circuitry, should be consulted to assure that electricity cannot reach the confined space after it has been disconnected (i.e. possible surge from adjacent pumps).*

Non-spark equipment shall be used at all times, unless a hot work permit has been issued. Equipment and appliances that may develop static electricity must be removed from the space to prevent inadvertent ignition of flammable gases or vapors. If doubt exists regarding a process and its potential for static electricity development, an electrician should be consulted. "Lockout" procedures for the confined space shall be used to secure machinery or moving parts that may be activated within the confined space.

The weather conditions and wind direction should be recorded on the confined space entry permit. During the entry, the attendant should stand up wind from the permit space.

### **2.2.3 Air Monitoring**

Before an employee or contractor enters the space, the internal atmosphere shall be tested by trained personnel with a calibrated, direct-reading instrument specific to: oxygen, combustible gas (percent lower explosive limit (LEL)), and toxic air contaminants. When testing for atmospheric hazards, *first test for oxygen, then for combustible gases and vapors, and lastly for toxic gases and vapors.*

The determinations and supporting data for the decision regarding the status of the space (i.e., permit-required, non-permit required with ventilation, or non-permit required) must be documented by the employer on the top portion of the entry permit (presented at the end of this attachment) and made available to the entrants. Table D-1 lists the applicable action levels for air monitoring in confined spaces.

Atmospheric testing shall be performed in all areas of the confined space (i.e. top, center and bottom portions of the space) as some gases and vapors heavier than air shall accumulate towards the bottom of the confined space and others gases lighter than air shall be found near the top of the confined space. Testing shall be performed before and during entrance for toxic gases, asphyxiating conditions and flammable or explosive gases. Instruments should be calibrated according to the manufacturers' recommendations each day entries are scheduled.

When air monitoring needs to be performed in a confined space and the atmospheric conditions have not been determined, sampling devices equipped with extensions, hoses or other apparatus should be used so personnel do not have to enter the space. Furthermore, precautions should be taken near the area immediately adjacent to the confined space if the potential for exposure to toxic or explosive gases exists.

#### **2.2.4 Preventing Physical Hazards**

Workers within the confined space must be protected from external hazards. Barriers must be provided to protect entry personnel from outside hazards including pedestrian and vehicle traffic.

Other physical hazards that may exist include:

1. Temperature extremes
2. Engulfment hazards, i.e. loose material collapsing
3. Noise
4. Slick wet surfaces

5. Falling objects
6. Slips, trips, and falls
7. Electrical hazards

The entrant shall wear a minimum of modified Level D protection with a hard hat, chemical resistant gloves, chemical resistant safety boots/shoes, splash goggles, and disposable chemical resistant clothing as necessary. Personal protective equipment is described in more detail in the Health and Safety Plan.

### **2.3 Confined Space Entry Permit**

The permit system serves as a checklist and documentation that proper non-permit and permit-required confined space entry determinations were made and that safety procedures were implemented by trained personnel. The permit system is the responsibility of the Health and Safety Coordinator (HSC), the Site Health and Safety Officer (SHSO) and all other trained personnel.

The entry supervisor shall sign or initial the permit before the entry begins, but not until all actions and conditions necessary for safe entry into the permit space have been performed. The permit shall be made readily available to all entrants during the operation. The standard suggests posting the permit near the confined space. Upon completion of the entry covered by the permit, and after all entrants have exited the permit space, the entry supervisor shall cancel the permit after proper closure of the confined space or if a situation arises which is prohibited under the entry permit. The canceled permit shall be retained for a period of at least one year.

The permit must be filled out completely for permit-required confined spaces and is only valid for the date issued. For non-permit spaces, the top portion of the entry permit must be completed along with results of verification atmospheric sampling.

The following information must be included on the permit:

1. Identification of the permit space to be entered;
2. Purpose of entry;
3. Date of entry and the authorized duration of the entry permit;
4. List of authorized entrants within the permit space;
5. List of attendants currently serving the permit space;
6. Name of the individual currently serving as entry supervisor;
7. The signature, together with the name printed or otherwise legible, of the entry supervisor who originally authorized entry;
8. The hazards of the permit space to be entered;
9. The measure used to isolate the permit space and to eliminate or control permit space hazards before entry;
10. The acceptable entry conditions;
11. The results of initial and periodic tests performed, accompanied by the names or initials of the testers and by an indication of when the tests were performed;
12. The rescue and emergency services that can be summoned and the means for summoning them;
13. The communication procedures used by authorized entrants and attendants to maintain contact during the entry;
14. Equipment, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance;
15. Any other information which is necessary, given the circumstances of the particular confined space, to ensure employee safety;

16. Any additional permits, such as for hot work, that have been issued to authorize work in the permit space; and
17. Employers who intend to authorize hot work in a permit space, such as welding, shall note that intention prominently on either the entry permit or on a separate hot work permit, which is attached to the permit.

## **2.4 Confined Space Entry**

Prior to entry into any confined space, the authorized entrant must notify emergency standby personnel of the entry by completing a radio check. A radio check must also be completed following the entry.

Confined spaces may be entered without a written permit or attendant provided that: 1) the space is determined not to be a permit-required confined space, or 2) the space can be maintained in a safe condition for entry by mechanical ventilation alone.

All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. Refer to the end of this attachment, for definitions of permit-required confined spaces and non-permit confined spaces.

Prior to any entry, the space should be "aired-out" or ventilated. Ventilation procedures are as follows:

1. After removing the entrance cover, the opening shall be guarded by a temporary barrier that shall prevent an accidental fall through the opening and that shall protect each employee working in the space from foreign objects entering the space.
2. Ventilate each confined space by removing the cover and allowing it to "air out" for at least fifteen minutes.
3. Test the space for oxygen deficiency, combustible gas (e.g., methane) and toxic gases or vapor (e.g., hydrogen sulfide), with a multiple gas detector and other appropriate equipment.

#### 2.4.1 Non-Permit Spaces

Non-permit spaces were not defined in the proposed confined space standard but have been added to the final rule to allow greater flexibility to facilities with low-hazard situations.

If it is determined that no hazardous atmosphere exists, continuous forced-air ventilation shall not be required prior to entry. However, if it is determined that a hazardous atmosphere does exist but can be adequately controlled by the use of forced air ventilation, the employer must follow the following procedures for ventilation in a non-permit space as described below.

Continuous forced air may be used as follows:

1. A worker (including contractors) may not enter the space until the forced air ventilation has eliminated the hazardous atmosphere;
2. The confined space should be ventilated with a ventilating fan and trunk hose. One end of the hose shall be attached to the fan and the other end shall be lowered into the confined space. Ventilation should be continuous.
3. The air supply for the forced air ventilation shall be from a clean, upwind source and may not increase the hazards in the space (e.g., diesel powered generators may introduce carbon monoxide into the space);
4. The forced air ventilation shall be so directed to ventilate the immediate areas where a worker is or shall be present within the space and shall continue until all employees have left the space; and
5. The atmosphere within the space shall be periodically tested with the fan running to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.

When there are changes in the use or configuration of a non-permit required space that might increase the hazards to the entrants, the employer shall reevaluate that space and, if necessary, reclassify it as a permit-required confined space.

If a hazardous atmosphere develops despite the use of forced air ventilation, the following procedures shall be followed:

1. Each employee shall leave the space immediately;
2. The space shall be evaluated to determine how the hazardous atmosphere developed; and
3. Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

If it is determined that a hazardous atmosphere cannot be controlled by the use of forced air ventilation, the confined space shall be reclassified as a permit-required confined space and shall be subject to the following requirements for permit-required confined space entry.

#### **2.4.2 Permit-Required Confined Spaces**

If it is determined that a permit-required confined space exists, employees shall be notified of the confined space via a sign which reads "**DANGER - PERMIT REQUIRED CONFINED SPACE, DO NOT ENTER**" or other similar language.

A half-face or full-face air purifying respirator as appropriate should be worn at all times by the authorized entrant if levels of toxic substances are present above the respective permissible exposure limit (PEL), threshold limit value (TLV) or other action level assigned by the SHSO. If an oxygen deficiency is present or if a toxic atmosphere exists that is immediately dangerous to life and health (IDLH) despite the use of forced air as described in Section 2.4.1, a self-contained breathing apparatus (SCBA) or supplied air respirator (SAR) must be worn by the authorized entrant.

### **2.4.3 Retrieval Systems**

Retrieval systems or methods must be used whenever an authorized entrant enters a permit-required confined space, unless the equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant.

Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, or above the entrant's head. Wristlets may be used in lieu of the chest or full body harness if the employer can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard, and that the use of wristlets is the safest and most effective alternative.

In spaces with a vertical depth greater than five feet, the other end of the retrieval line shall be attached to a mechanical device (e.g., tripod with winch) outside the permit space so that the rescue can begin as soon as the rescuer becomes aware that rescue is necessary. In all other permit-required confined spaces, the retrieval lines must be attached to a mechanical device or a fixed point outside the permit space.

## **2.5 Contractor Requirements for Confined Space Entry**

If a contractor is ever required to enter a permit-required confined space located at the Site, the contractors must be apprised of and comply with the following procedures:

1. Inform the contractor that the work place contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting requirements of the standard;
2. Apprise the contractor of any precautions or procedures that the host employer has implemented to protect employees in or near permit spaces where contractor personnel shall be working;
3. Apprise the contractor of the elements, including the hazards identified and the host employer's experience with the space, which make the space in question a permit space;

4. Coordinate entry operations with the contractor when both host employer personnel and contractor personnel shall be working in or near permit spaces; and
5. Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and any hazards confronted or created in permit spaces during entry.

The contractor shall:

1. Enter the permit-required confined space only after completing of atmospheric testing;
2. Obtain any available information regarding permit space hazards and entry operations from the host employer;
3. Coordinate entry operations with the host employer, when both host employer personnel and contractor personnel shall be working in or near permit spaces; and
4. Inform the host employer of the permit space program that the contractor shall follow and of any hazards confronted or created in permit spaces, either through a debriefing or during the entry operation.

### 3.0 PERSONNEL TRAINING REQUIREMENTS

Confined space entry training procedures are required for all employees involved in the confined space program. Training shall be provided for employees to acquire the understanding, knowledge, and skills necessary to safely perform the duties assigned and shall introduce new or revised procedures, as necessary, for compliance. Training shall be provided to each affected employee:

1. Before the employee is first assigned confined space entry duties;
2. Before there is a change in assigned duties;
3. Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained;
4. Whenever the employer has reason to believe that there are deviations from the permit space entry procedures specified in this plan or that there are inadequacies in the employee's knowledge or use of these procedures.

At a minimum, the employee must have a working knowledge of the following:

1. Hazard recognition;
2. Operating testing and monitoring equipment to verify that acceptable environmental conditions are being maintained during entry;
3. Maintenance of monitoring equipment;
4. Personal protective equipment, respirators, clothing and retrieval lines, etc.;
5. Rescue services to be summoned;
6. Rescue equipment provided on Site, (e.g. safety harnesses, tripod, winch, first aid kit, ventilation equipment, fire extinguisher, stretcher, water, container to hold contaminated materials, additional personal protective equipment);
7. Communications procedures and equipment; and
8. Any other site-specifics information given in the entry permit to insure employee safety.

The HSC is required to certify that the training has been accomplished. The certificate should include each employee's name, the signature or initials of the trainers, and the dates of training. The certificate of training is contained in this attachment and shall be maintained for the duration of employment.

## 4.0 HOT WORK PROCEDURES

### 4.1 General

As per 29 CFR 1910.119(k), a hot work permit must be issued for hot work operations conducted in or near a covered area such as a confined space. Hot work is defined as work involving the use of electric or gas welding, cutting, brazing, or similar flame or spark-producing operations. The permit shall document that fire prevention and protection requirements (as specified in 29 CFR 1910.252(a)) have been undertaken prior to beginning the hot work operations. The permit must indicate the date(s) authorized for hot work and identify the object on which the work is to be performed. The permit must be kept on file until completion of the hot work operations.

The hot work permit acts exclusively as an addendum to the confined space entry permit and does not serve as the confined space entry permit while "hot work" is being performed. In other words, when hot work is being performed inside a confined space, the confined space entry permit must be completed with the hot work permit attached. The hot work permit is valid only for the date(s) issued.

Part 1910.252(a) of Title 29 specifies general fire prevention and protection requirements necessary during welding, cutting and brazing operations. Below are specific safety practices which must be adhered to:

1. If the object to be welded or cut cannot readily be moved, all movable fire hazards in the vicinity must be taken to a safe place. If the object cannot be moved and fire hazards cannot be removed, then guards shall be used to confine heat and sparks and to protect the immovable fire hazards.
2. Suitable fire extinguishing equipment must be maintained and ready for use. Such equipment may consist of pails of water or sand or portable extinguishers.

3. Before cutting or welding is permitted, the area shall be inspected by the individual responsible for authorizing the operations. The person shall designate precautions to be followed in granting authorization to proceed in the form of the written hot work permit.
4. When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur. The machine shall be disconnected from the power source.
5. To minimize the possibility of gas escaping through leaks or improperly closed valves when gas welding or cutting, the torch valves shall be closed and the gas supply to the torch positively shut off at some point outside the confined area whenever the torch shall not be used for a substantial period of time. Where practicable, the torch and hose should be removed from the confined space.

#### **4.2 Management Responsibilities**

It is the responsibility of management to advise all contractors about flammable materials or hazardous conditions as related to performing hot work. The SHSO shall be responsible for the overall administration of the hot work permit program. They shall ensure that work areas have been properly prepared for the hot work and that the hot work permit has been properly completed.

## 5.0 RESCUE AND EMERGENCY SERVICES

Confined space entry rescues at the Site shall employ the use of trained employees to enter permit spaces to perform rescue services in the event of a confined space entry emergency. The designated rescue team shall be informed of the hazards that may be confronted when asked to perform a rescue at the facility. Access must be provided to all permit spaces.

If an injured entrant is exposed to a substance noted on the required material safety data sheet kept at the work Site, that MSDS shall be made available to the medical facility treating the exposed entrant. The following training requirements apply to employees who are members of the on-site rescue service:

1. Each member of the rescue team must be provided with, and trained in the proper use of personal protective equipment and rescue equipment necessary for making rescues from permit spaces.
2. Each member of the rescue team must be trained to perform the assigned rescue duties and receive the training required of employees involved in the confined space entry.
3. Members of the rescue team shall practice making permit space rescues at least once every twelve months, by simulating rescue operations in which dummies, manikins, or actual persons are removed from the permit spaces or from representative permit spaces. Representative permit spaces shall simulate the types of permit spaces from which rescue is to be performed, with respect to opening size, configuration, and accessibility.
4. Training shall include basic first-aid and cardiopulmonary resuscitation (CPR). At least one member of the rescue team holding current certification in first aid and in CPR shall be available.

Members of the rescue team shall enter the confined space only if a non-entry rescue is infeasible and atmospheric hazards do not exist. To facilitate a non-entry rescue, retrieval systems or methods complying with the retrieval systems for confined space entry procedures (Section 2.4) shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant.

## 6.0 APPLICABLE DEFINITIONS

**Attendant:** Individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program. Attendants may be assigned to monitor more than one space and may be stationed at any location outside the permit space, as long as they can effectively perform the duties defined in the permit space program. The attendants may not monitor more permit space entry operations than they can safely handle.

**Authorized Entrant:** Employee who is authorized by the employer to enter a permit space.

**Confined Space:** is a space that:

1. is large enough and so configured that an employee can bodily enter and perform assigned work; and
2. has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means or entry); and
3. is not designed for continuous employee occupancy.

**Entry:** the action by which a person passes through an opening into a permit-required confined space (PRCS). Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

**Entry Supervisor:** The person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, overseeing entry operations to determine if the conditions are acceptable for entry, authorizing entry to begin, authorizing entry permits and canceling permits, and taking the necessary measures to protect personnel from permit space hazards.

**Hazardous Atmosphere:** An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue, serious injury or acute illness due to:

1. A flammable gas, vapor, or mist in excess of ten percent of its lower explosive limit (LEL);
2. An airborne combustible dust at a concentration that exceeds its lower explosive limit (LEL);

3. An atmospheric oxygen concentration that is less than 19.5 percent or greater than 23.5 percent;
4. An atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G or Subpart Z of 29 CFR 1910 and that could result in employee exposure above the pertinent dose limit or permissible exposure limit; and
5. Any other atmospheric condition recognized as immediately dangerous to life or health.

**Non-Permit Confined Space:** a confined space that does not contain or, with respect to atmosphere hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

**Permit-Required Confined Space (PRCS):** a confined space that has one or more of the following characteristics:

1. Contains (as obtained by a field air screening instrument) or has a potential to contain a hazardous atmosphere;
2. Contains a material that has the potential for engulfing an entrant;
3. Has an internal configuration so that an entrant could be trapped or asphyxiated by inwardly converging walls or a floor which slopes downward and tapers to a smaller cross-section; and/or,
4. Contains any other recognized serious safety or health hazard.

**Permit-Required Confined Space Program:** The overall program for controlling, and, where appropriate, for protecting employees from permit space hazards and for regulating employee entry into permit spaces.

## HOT WORK PERMIT

Effective permit dates: \_\_\_\_\_

Persons authorized to perform work: \_\_\_\_\_

Description and location of work to be performed: \_\_\_\_\_

"Hot" equipment to be used (e.g. welding, cutting torches, etc.): \_\_\_\_\_

Additional safety procedures to be followed: \_\_\_\_\_

\_\_\_\_\_  
Health and Safety Coordinator

\_\_\_\_\_  
Health and Safety Officer

\* This permit is valid only for the date(s) issued and must be accompanied with a valid Confined Space Entry Permit.

### CONFINED SPACE ENTRY PERMIT

All copies of permit shall remain at job Site until job is completed. This permit is only valid for date issued.

LOCATION and DESCRIPTION  
of CONFINED SPACE \_\_\_\_\_

Date \_\_\_\_\_

PURPOSE of Entry \_\_\_\_\_

Time \_\_\_\_\_

RESCUE TEAM MEMBERS \_\_\_\_\_

ENTRY SUPERVISOR \_\_\_\_\_

WEATHER CONDITIONS \_\_\_\_\_

WIND DIRECTION \_\_\_\_\_

#### DETERMINE TYPE OF CONFINED SPACE

Does confined space have potential to contain one or more of the following (check those that apply):

\_\_\_ a hazardous atmosphere (a hazardous atmosphere is defined as any atmosphere where the action levels are exceeded for the measured contaminants)

\_\_\_ Document verification testing results in table below.  
\_\_\_ a material that has potential for engulfing an entrant

\_\_\_ an internal configuration that may cause trapping or asphyxiation

\_\_\_ other serious safety or health hazards (please specify)

☐ Permit-required confined space

☐ Non-permit space

If confined space contains one of the aforementioned criteria, the confined space shall be deemed a permit-required confined space.

#### LIST OF AUTHORIZED ENTRANTS

SPECIAL REQUIREMENTS	YES	NO		YES	NO
Lock Out - De-energize - Shutdown Open Flames			Escape Harness/Lifelines/Retrieval System		
Lines Broken - Capped or Blanked			Safety Manual		
Purge - Flush and Vent			Communications Equipment (RADIOS, etc.)		
Ventilation Equipment (fan & hose)			Fire Extinguishers		
Secure Area/Rope Off/Post NO SMOKING Signs			Lighting		
Breathing Apparatus/SCBA/Respirator			Protective Clothing/Boots/Gloves/Splash Goggles		
Combustible Gas Indicator, Photoionization Detector, H <sub>2</sub> S+CO Meter, Oxygen Detector			other (list on back)		

## CONFINED SPACE ENTRY PERMIT

TEST(S) TO BE TAKEN *(valid for one 2-hour turn only)	ACTION LEVEL	TEST LOCATIONS/RESULTS				
% of Oxygen	≤19.5% or ≥23.5%					
% of Lower Explosive Limit (LEL)	≥10%					
Hydrogen Sulfide	≥5 ppm					
Carbon Monoxide (CO)	≥30 ppm					
other (list)	Varies					

ATMOSPHERE TESTER \_\_\_\_\_  
 \_\_\_\_\_ NAME (please print)

Note: Continuous/periodic testing regimen shall be established before beginning job. Any questions pertaining to test requirements contact the Project Manager.

INSTRUMENTS USED	NAME	TYPE	MODEL & SERIAL NO.

SUPERVISOR AUTHORIZING ALL ABOVE CONDITIONS SATISFIED (Entry Supervisor)  
SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

AMBULANCE \_\_\_\_\_ FIRE \_\_\_\_\_

## CONFINED SPACE ENTRY PROGRAM

**TABLE D-1**

### Action Levels

MONITORING EQUIPMENT	MEASURED LEVEL	ACTION
Explosive/Combustible Meter <sup>a</sup>	0-10% LEL	Continue work
	>10% LEL	Cease all operations, leave space, and contact SHSO. Potential explosive hazard
Oxygen Meter	< 19.5%	Cease all operations, leave space, and contact SHSO
	19.5% - 23.5%	Continue work. Deviation from normal level may be due to the presence of other substances
	>23.5	Cease all operations, leave space, and contact SHSO. Potential fire hazard

- a. - Combustible gas readings are not valid in atmosphere with < 19.5 percent oxygen.

**ATTACHMENT E**

**Trenching and Excavation Supplement**

## **TRENCHING AND EXCAVATION SUPPLEMENT**

This document covers the provisions set forth in the federal OSHA Excavation Standard, 29 CFR Part 1926.650-653, Subpart P. The standard establishes safety procedures and engineering controls to be followed when entry into trenches and excavations is necessary. This Trenching and Excavation Supplement provides a general outline of the procedures to be used when working in excavations, and to the applicable OSHA trenching and excavation references. This document is neither all inclusive nor is it intended to replace federal and state OSHA guidelines.

According to the OSHA standard, a trench is referred to as a narrow excavation below the surface of the ground. In general, the depth is greater than the width, but the width (measured at the bottom) is not greater than fifteen feet. An excavation is any man-made cut, cavity, trench, or depression in the earth's surface formed by earth removal.

Site personnel shall be trained to recognize hazards associated with trenches and excavations, such as cave-ins, hazardous atmospheres, surface encumbrances, traffic conditions, water accumulation, and underground utilities. Site personnel shall become familiar with the work practices and engineering controls necessary to mitigate such hazards.

Personnel working at the Site shall not be permitted to enter trenches or excavations unless it is deemed inherently necessary. If entrance is necessary, the SHSO or HSC shall be notified prior to entering.

It is important to establish standard operating procedures for all employees who are either directly involved with performing excavation work or who are required to inspect such work, must follow. Some of the procedures to be followed are identified below.

## **1.0 Utilities**

All surface obstacles, such as telephone poles, fire hydrants, buildings, fences, vehicles, etc. shall be removed or supported. Where the potential exists or encountering underground utilities, the following procedures shall be implemented:

1. estimate the location of utility installations prior to beginning the work;
2. contact utility companies to advise them of the proposed work and to establish underground utility locations prior to beginning work; and
3. protect, support, or remove underground pipelines, cables, or other installations as necessary.

## **1.1 Access and Egress**

Ramps may be used if designed by a qualified, competent person. Ramps with two or more members must have the members connected. All connecting cleats must be attached to the bottom of the ramp and in a manner to prevent tripping hazards. All members must be of uniform thickness and all ramp surfaces shall consist of non-slip surfaces. A means of access and egress (ladders, ramps, etc.) for all trenches four feet or over in depth shall be required and located not more than twenty-five feet from where employees are working.

## **1.2 Heavy Equipment**

All personnel exposed to vehicular traffic in the vicinity of the excavation area shall wear warning vests made of bright orange reflective material. No personnel may be permitted underneath loads or objects capable of falling. Operators of mobile equipment must have a clear view while working near the excavation or have other warning devices such as barricades, hand mechanical signal devices, or stop blocks. Heavy equipment must stop at least two feet from the side of any excavation. If possible, the grade should be away from the excavation.

### **1.3 Air Monitoring**

Atmospheric monitoring is required under the following conditions if:

1. atmospheric conditions could potentially be below 19.5 percent oxygen by volume;
2. a potentially explosive atmosphere may exist in the excavation (i.e., >10% LEL);
3. atmospheric conditions present the potential for the presence of toxic gases and vapors in the excavation; and
4. it is known that little or no natural ventilation can occur in the excavation.

Entrance shall not be permitted if it is deemed that a hazardous atmosphere does exist until the Health and Safety Coordinator (HSC) has been consulted and the proper provisions have been established.

### **1.4 Water Accumulation**

Personnel shall not be allowed entry into excavations containing water or in excavation where water has accumulated unless water can be removed from the excavation. Procedures under these circumstances include, but are not limited to:

1. use of special precautions such as special shoring, pumps, or a lifeline and harness;
2. presence of a competent person to monitor conditions in the excavation; and
3. when natural drainage is interrupted, a dike, diversion ditch or other means shall be used to prevent runoff from entering into or accumulating in an adjacent area; and
4. no electrical devices shall be permitted inside excavations until all water has been removed.

### **1.5 Adjacent Structures**

When affected by the excavation, adjacent structures shall be adequately supported by shoring, bracing, or underpinning to ensure stability. Excavating below footings of foundation shall not be permitted unless the following conditions are met:

1. a support system is used;
2. the excavation is in stable rock; or
3. a professional engineer deems it to be stable.

Streets, sidewalks or other structures shall not be undermined by the excavation, unless adequate support systems are used.

#### **1.6 Protection from loose rock or soil**

Precautions, such as removing loose material, installing protective barricades, etc., shall be taken to protect employees from loose rock and soil falling or rolling from the excavation face. Excavated materials, equipment, and tools shall be set back at least two feet from excavation walls or guarded from falling into excavations.

#### **1.7 Inspections**

A competent person must inspect the excavations, adjacent areas, and protective systems daily prior to each shift and throughout the shift to ensure that hazardous conditions or a hazardous atmosphere does not exist. All personnel shall be kept away from hazardous areas until hazards have been eliminated, controlled, or corrected. Inspections shall be made after every rainstorm or other hazardous occurrence.

#### **1.8 Fall protection**

Hand rails or guards shall be provided where personnel or equipment are permitted to cross over excavations on walkways or bridges. Barriers shall be provided when an excavation is left unattended unless access cannot be gained to the excavated area.

### **1.9 Sloping and Benching Design**

Sloping and benching design shall be selected by the Project Coordinator or his or her designee and must follow requirements set forth in 29 CFR 1926, Subpart P. Specific requirements are established in 29 CFR 1926.652(b) and (c), and Subpart P, Appendix A, B, C, D, E, and F which include:

1. Subpart P, Appendix A details the procedures to be used to classify soil;
2. Subpart P, Appendix B defines the sloping and benching systems to be used, based on soil type and excavation configuration;
3. Subpart P, Appendix C specifies minimum timber shoring requirements for trenches according to soil type and excavation configuration;
4. Subpart P, Appendix D specifies aluminum hydraulic shoring for trenches according to soil type and excavation configuration;
5. Subpart P, Appendix E provides alternatives to Timber Shoring; and
6. Subpart P, Appendix F contains a decision chart for the selection of protective systems.

### **1.10 Protective Systems**

The following procedures shall be implemented as applicable for trench boxes, aluminum hydraulic shoring systems, timber shoring systems, etc.:

1. all members of the system shall be securely connected to prevent failure;
2. the system shall be installed and removed in a manner as to protect personnel from cave-ins;
3. support members shall not be subjected to forces greater than their design strength as reported by the manufacturer;
4. removal shall begin from bottom to top, release shall occur slowly, and temporary members shall be installed to protect personnel working in the trench;
5. backfill shall progress along with the moving or removal of a protective system;
6. excavation depth may not exceed more than two feet past the bottom of the system;

and

7. personnel shall not be permitted in the excavation during installation, removal, or replacement of the protective system.

The OSHA Excavation Standard requires that a "competent person" be designated to make judgments regarding the use of sloping and benching techniques. The competent person shall be an individual capable of identifying existing and predictable hazards in the work area which pose potential physical danger to employees. He/she has the authorization to take prompt corrective actions to mitigate any potential hazards.

Site personnel shall follow the instructions of the competent person and the set requirements as detailed in 29 CFR 1926, Subpart P. Additional OSHA Standards for hazardous energy control (lockout/tagout), personnel protective equipment, confined space entry, and hazard communication may apply to work scenarios involving excavation and should be referenced and followed as appropriate.

#### **1.11 Training Requirements**

Initial training of affected site personnel shall include an overview of the OSHA Excavation Standard and a detailed review of required sloping, benching, and protective system uses and techniques as they apply to typical soil stability conditions at the Site.

Refresher training shall be required when the standard is revised and when new sloping, benching, and protective system techniques are instituted.

## **1.12 Definitions**

Aluminum Hydraulic Shoring means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed, specifically to support the sidewalls of an excavation and prevent cave-ins.

Benching (Benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-In means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Competent Person means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Cross Braces mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Excavation means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Hazardous Atmosphere means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout means the accidental release or failure of a cross brace.

Sheeting means the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in accordance with this standard. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring system) means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable Rock means natural solid mineral material that can be excavated with vertical sides and shall remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Support System means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Trench (Trench excavation) means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Uprights mean the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Wales mean horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

**ATTACHMENT F**

Energy Control  
(Lockout/Tagout)

## **HAZARDOUS ENERGY CONTROL PROGRAM**

### **(LOCKOUT/TAGOUT)**

The Occupational Safety and Health Administration (OSHA) has an existing standard, 29 CFR 1910.147, governing the control of hazardous energy sources (lockout/tagout) in workplaces. The standard covers servicing and maintenance (including installation and removal) of machines and equipment in which the unexpected energizing or start up of the machines and equipment or release of stored energy could cause injury to employees. The rule requires that energy sources for the equipment be turned off or disconnected prior to performing work and that the switch either be locked or at the very least be labeled with a warning tag or both depending on circumstances.

Industrial personnel and contractors who perform service on such machines and equipment face the greatest risk. These include craft personnel, maintenance personnel, machine operators and laborers.

At this Site, employees shall be working around, installing, fixing, or removing devices like pumps, fans, electrical apparatus, controls, etc. Typical injuries associated with the non-existence or improper use of a lockout/tagout system could include fractures, lacerations, electrocutions, contusions, amputations, and puncture wounds. At this Site, we shall utilize a program to comply with OSHA requirements and must insist that all employees and contractors comply with these rules as a minimum.

### **PROGRAM REQUIREMENTS**

1. Prior to work, contractors shall mark machines and their disconnecting means so that appropriate switch gear can be quickly located. If markings become unreadable, please report it to your supervisor.
2. Employees must use key locks on devices, machine control boxes or on electrical circuit breaker boxes when maintenance, repair, installation or removal is being performed.

3. Ensure that new equipment or overhauled equipment can accommodate locks. Retrofit equipment to accept locks where feasible. Locking is the preferred method of control.
4. Employees must implement additional means as necessary to ensure safety when tags rather than locks are used by implementing an effective tagout program. Tag devices shall be constructed and printed so that exposure to moisture and corrosive chemicals shall not cause deterioration and render them unreadable (see sample tags attached). Tagout device attachment means shall be non-reusable, attachable by hand, self-locking and non-releasable with a minimum unlocking strength of no less than fifty pounds and having the general design and characteristics equivalent to a one-piece, all environment-tolerant nylon cable tie. Tagout devices shall warn against hazardous conditions if the machine is energized and shall include a legend such as: **DO NOT START, DO NOT OPEN, DO NOT CLOSE, DO NOT ENERGIZE, DO NOT OPERATE.** Tagout devices are readily available for purchase through safety supply catalogs. Nylon ties are available at most industrial supply outlets.
5. Lockout and tagout devices should be standardized throughout the project utilizing the following criteria as applicable: color, shape, size, and in the case of tagout devices, print and format.
6. The project HSO shall conduct regular inspections of energy control procedures as deemed necessary to assure proper use of the program. The inspection shall be designed to correct any deviations or inadequacies observed.
7. If another crew or person continues to work on the maintenance installation, removal or repair job during the next shift, the relief personnel shall put his or her lock on before the initial personnel removes his or her lock.
8. Minor adjustment and servicing activities, which might take place during normal operations, shall not require lockout/tagout procedures to be employed if they are routine, repetitive, and integral to the use of the equipment for production, but other standard OSHA safeguarding procedures or mechanisms (e.g., guards) must be utilized.
9. Before lockouts or tagouts are removed and energy is restored to the equipment or machine, the following procedures shall be followed: 1) the work area shall be inspected to ensure that non-essential items have been removed and machine components are operationally intact; 2) the work area shall be checked to ensure that all employees are safely positioned or removed; and 3) affected employees shall be notified that lockout/tagout devices have been removed.
10. Each lockout/tagout device shall be removed only by the employee who applied the device. If that employee is not available to remove it, the device may be removed under the direction of the HSC, SHSO, or Project Coordinator, but only after it has been verified that the authorized employee is not at the facility.

11. Under no circumstances should locks or keys be loaned or borrowed. Lost keys shall be reported immediately and duplicates destroyed.

## **ATTACHMENT G**

Emergency Telephone Numbers and Map to Hospital

## EMERGENCY TELEPHONE NUMBERS

Site Name Toledo Tie Treatment Site

### GENERAL

### PHONE

U.S. EPA 24-Hour Hotline (National Response Center)  
CHEMTREC (Chemical Information)

1-800-424-8802  
1-800-424-9300

### LOCAL

Ambulance  
Fire

419/693-1611  
419/729-4811

Lucas County Sheriff  
Police

419/243-5111  
419/243-4141

Hospital

419/383-3888

\* 911 services available

Environmental Services – Bill Garber

419/936-3015

Public Utilities Department – Bob Williams

419/245-1800

Local Emergency Planning Committee (LEPC)

Emergency Coordinator – Bill Halsey (day)  
(24 HR)

419/245-0662  
419/245-4977

Spill Response Contractor – Heritage Environmental

419/389-1451

Ohio Utilities Protection Service(OUPS)

800/362-2264

### Kerr-McGee Chemical, LLC

Project Coordinator: Peter Goetz

Office 405/447-8300  
Pager 888/732-8904  
Mobile 405/833-9009

### Hull & Associates, Inc.

Project Manager: Scott F. Lockhart, P.E.

Office 419/241-7171  
Pager 419/323-1396  
Mobile 419/262-9318

Health and Safety Coordinator: to be determined

Office \_\_\_\_\_  
Mobile \_\_\_\_\_

Health and Safety Officer: To be determined by PC

Office \_\_\_\_\_  
Mobile \_\_\_\_\_

**U.S. EPA**

On-scene Coordinator: Ralph Dollhopf

Office 313/692-7682

Pager 800/395-8903

Remedial Project Manager: Deborah Orr

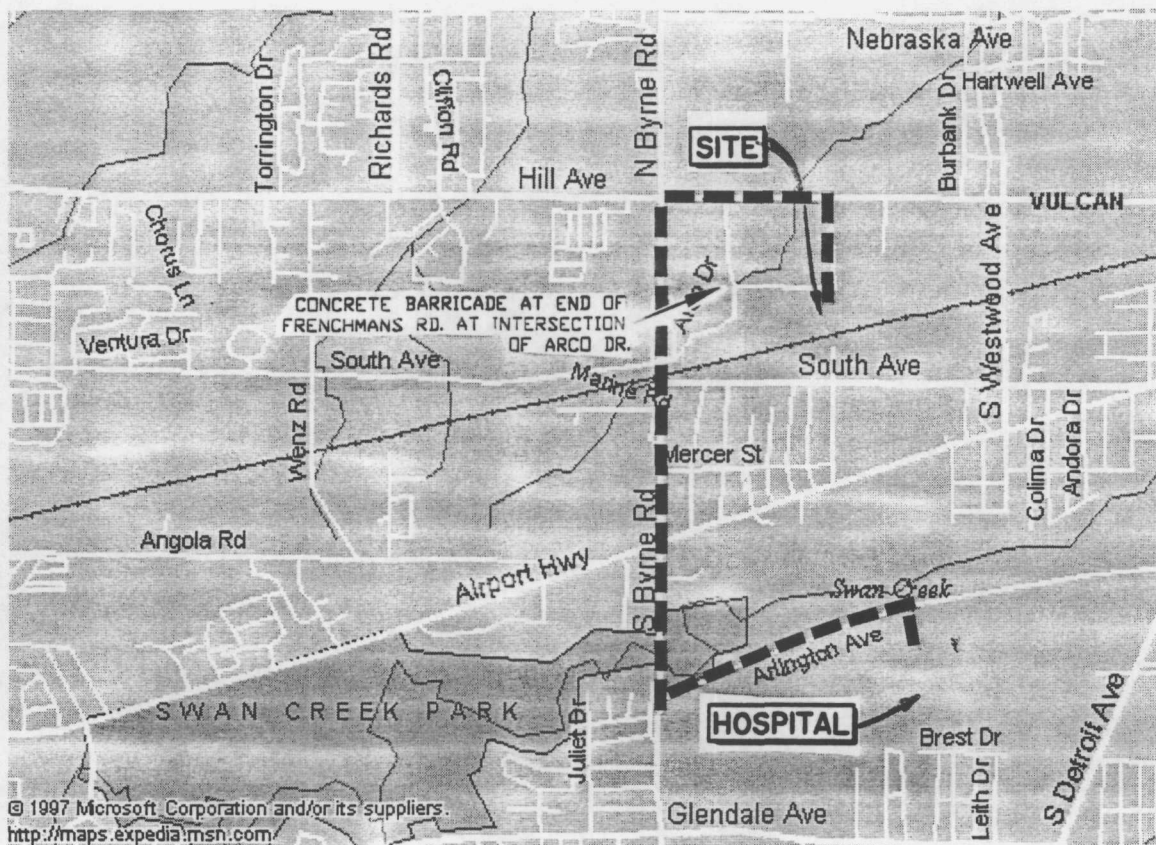
Office 312/886-7576

### **HOSPITAL DIRECTIONS**

Name of Hospital: Medical College Hospital, 3000 Arlington Avenue, Toledo, OH 43614

Phone: 419-383-3888

Route to Hospital: Follow Elmdale Road north from the Site to Hill Ave. Go left (west) on Hill Ave, one block to Byrne Road. Turn left on Byrne Road and go south approximately one and a half miles to Arlington Avenue. Turn left (east) on Arlington Ave. and take this approximately one half mile to the emergency entrance on the right hand side and follow the signs.



#### LEGEND

----- ROUTE TO HOSPITAL MAP

#### ATTACHMENT G

Hull & Associates, Inc.  
TOLEDO, OHIO

HEALTH & SAFETY PLAN  
KERR-McGEE CHEMICAL, LLC  
TOLEDO TIE TREATMENT SUPERFUND SITE  
**ROUTE TO HOSPITAL MAP**  
CITY OF TOLEDO, LUCAS CO., OHIO

DATE:  
FEBRUARY 1998 (REVISED 3/19/98)

PWM001

**ATTACHMENT H**

**Accident Injury/Illness Investigation**



Hull & Associates, Inc.  
2726 Monroe Street  
Toledo, Ohio 43606  
Telephone (419) 241-7171  
Fax (419) 241-3117

## INJURY/ILLNESS INVESTIGATION REPORT

Employee Name \_\_\_\_\_ Position \_\_\_\_\_

Date of Birth \_\_\_\_\_

SSN \_\_\_\_\_

Date of Incident \_\_\_\_\_ Time \_\_\_\_\_

Accident Location \_\_\_\_\_  
\_\_\_\_\_

Length of Employment with HAI \_\_\_\_\_

Length of Time at Job Site \_\_\_\_\_

Time Shift Started \_\_\_\_\_

Full Description of Incident \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What factors led to Incident \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What Equipment or Machinery was involved \_\_\_\_\_  
\_\_\_\_\_

What Personal Protective Equipment was Employee wearing \_\_\_\_\_  
\_\_\_\_\_

Describe Weather Conditions and Terrain \_\_\_\_\_  
\_\_\_\_\_

Follow up Actions Required \_\_\_\_\_  
\_\_\_\_\_

Additional Concerns \_\_\_\_\_  
\_\_\_\_\_

Did Employee Receive Professional Medical Attention \_\_\_\_\_

Was Employee Hospitalized \_\_\_\_\_

Name/Address of Hospital/Clinic \_\_\_\_\_  
\_\_\_\_\_

Name of Physician \_\_\_\_\_ Telephone \_\_\_\_\_

Was a Health and Safety Plan prepared for this project \_\_\_\_\_

Was an on-site or interoffice Health and Safety meeting held for this project \_\_\_\_\_

If so, When \_\_\_\_\_

Who attended \_\_\_\_\_

Employee Statement \_\_\_\_\_

By \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

Witness Statement \_\_\_\_\_

By \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

Project Manager Statement \_\_\_\_\_

By \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

HSO/HSM Review \_\_\_\_\_

By \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

OSHA Recordable Incident \_\_\_\_\_

OSHA forms 101,200 Properly logged \_\_\_\_\_